CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

As a reminder of how the EIS refers to Alternatives, Chapter 4 discusses the environmental consequences associated with the Build Alternatives, the No-Build Alternative, and the No-Action Alternative.

- **Build Alternatives**. The Build Alternatives include the Proposed Action and other Alternatives that would require new rail line construction. The name of each Build Alternative (i.e., the Proposed Action, the Original Taylor Bayou Crossing and Alternatives 1C, 2B, and 2D) is derived from the various proposed new rail alignments and includes both the proposed new rail line segment and the use of trackage rights over UP lines that BNSF either has or can obtain under the UP/SP merger decision. The segments of each Build Alternative that involve new rail line construction are referred to as the Build Segments of that Alternative.

- **No-Build Alternative**. The No-Build Alternative requires no new rail line construction. It would require BNSF to obtain trackage rights from UP over the Strang Subdivision to access the Bayport Loop. These are trackage rights that BNSF cannot obtain under the UP/SP merger decision and that UP has not granted in response to BNSF's request. BNSF would use the same trackage rights over existing UP lines that BNSF would use for the Proposed Action, although under this Alternative BNSF would need trackage rights over a smaller portion of the GH&H line than for the Build Alternatives.

- **No-Action Alternative**. Under the No-Action Alternative, the Applicants would not provide competitive rail service to the Bayport Loop, either by new construction or trackage rights. The shippers in the Bayport Loop would continue to be solely served by UP. The rail operations on the rail lines to and from the Bayport Loop in the Houston area would remain as they are today.

Chapter 4 is arranged in sections that discuss the environmental consequences for each Alternative within each environmental resource area. Depending on the nature of the potential effect for an environmental resource area, the discussion may address both the existing rail lines and the Build Segments, only the Build Segments, or only the existing rail lines.

4.1 RAIL OPERATIONS AND RAIL OPERATIONS SAFETY

4.1.1 Methodology

SEA ordinarily analyzes impacts associated with rail operations and rail operations safety when a Proposed Action would create an increase of eight trains per day or more. However, in response to concerns raised over the Proposed Action, SEA analyzed rail operations and rail operations safety issues associated with the Proposed Action and Alternatives, which involve two trains per day, on average.

SEA analyzed the operations of the Proposed Action and Alternatives in the context of the existing operational and safety conditions described in Section 3.1. SEA analyzed rail operations and safety effects along the existing rail lines from the CMC Dayton Yard, over the Baytown, Lafayette, Terminal, and East Belt Subdivisions and the GH&H line, and over each of the proposed Build Segments. In addition, SEA examined operations and safety for the existing UP lines that comprise the No-Build and No-Action Alternatives based on the available information. SEA also consulted with FRA on the potential effects of the Proposed Action and Alternatives on rail operations and rail operations safety and reviewed existing FRA regulatory requirements and operational procedures. SEA qualitatively evaluated the proposed rail operations and operational safety because of the low number of trains (two per day on average) that would be added to the existing operations, the existing operational conditions on the rail lines involved, the distances involved, and the proposed slow train speeds on the Build Segments.

4.1.2 Impact Analysis – Rail Operations

4.1.2.1 Build Alternatives

The Build Alternatives include new track construction and operation over UP's GH&H line, the East Belt, Terminal, and Lafayette Subdivisions to Dayton Junction, and over a portion of UP's Baytown Subdivision to the CMC Dayton Yard.

The proposed construction of new track consists of approximately 12.8 miles of track between the Bayport Loop and the GH&H line.[1] Two trains per day, the equivalent of one round trip with one train going to the Bayport Loop and one train returning from the Bayport Loop, are proposed to operate over the new track. The operation of two trains per day over the new track would not be expected to have any impact upon train operations because only one train would be operating at a time on the line. Current railroad industry regulations and practices allow the operation of two trains per day without a railroad signaling system as long as the operating rules include a method of operations such as Track Warrant Control (TWC), Block Register Territory, or Other than Main Track operations.

GH&H Line. The operation of two additional trains over UP's GH&H line (for up to approximately 16.2 miles between the north end of Graham Siding and Tower 85) is expected to have a negligible impact upon train operations. The GH&H line currently handles an average of 3.4 trains per day south of Tower 30 and an average of five trains per day between Tower 30 and Tower 85 and the train operations are controlled by CTC between Tower 85 and Graham Siding and by TWC at Graham Siding. The portion of the GH&H line between Tower 85 and Graham Siding should be capable of accommodating at least 15 to 16 trains per day, assuming that the trains are not evenly spread over the 24-hour period and that conflicts would occur in the vicinity of Tower 30 and Tower 85 due to the adjacent junction trackage and number of trains operating through the area. The most probable location for any impact to occur would be at Tower 85 and at the junction of the new rail line and the GH&H line with the new BNSF trains having to wait until other trains clear the GH&H line before they would be authorized to enter the GH&H

[1] The exact length varies slightly among the Build Alternatives.

trackage. With 3.4 trains per day on average, it is unlikely that a BNSF train would encounter a UP train and if they did, there is still substantial excess capacity on the GH&H.

East Belt Subdivision. At Tower 85, BNSF trains would turn northward over the East Belt Subdivision and would travel to Tower 87, which is located near the east end of UP's Englewood Yard. Between Tower 85 and Tower 87, the East Belt Subdivision consists of 4.7 miles of double track, which is governed by CTC, and has a maximum speed of 20 mph. An average of 25.1 trains per day operate over this portion of the East Belt Subdivision. The routing of the two proposed BNSF Bayport Loop trains is expected to have a negligible impact on East Belt train operations given the estimated capacity of at least 36 to 40 trains per day.

Terminal and Lafayette Subdivisions. At Tower 87, BNSF trains would turn east over the UP's Terminal and Lafayette Subdivisions and travel approximately 29 miles to Dayton Junction. The Terminal Subdivision includes the segment between Tower 87 and Dawes, a distance of 3.8 miles. The line has double track, CTC, and a maximum operating speed of 50 mph, except for 0.6 miles closest to Tower 87 that has a maximum operating speed of 25 mph. The Lafayette Subdivision includes the 25.3-mile segment between Dawes and Dayton Junction. This segment of line has single track, with CTC. The maximum operating speed is 60 mph (70 mph for passenger trains) but several speed restrictions exist. The speed restrictions vary from 30 mph to 60 mph. The Terminal and Lafayette Subdivisions are used by UP primarily for westbound trains (the ex-Missouri Pacific Line located farther north is used primarily for eastbound trains). BNSF would utilize existing trackage rights between Tower 87 and Dayton Junction, but would operate their trains in both directions over the line. An average of 20.7 trains per day operate between Tower 87 and Dayton Junction including the Amtrak Sunset Limited passenger train that operates three days per week in each direction over this route. The daily routing of the two proposed BNSF Bayport Loop trains is expected to have a negligible impact on the Terminal and Lafayette Subdivision train operations given the estimated capacity of at least 50 trains per day.

Baytown Subdivision. Upon reaching Dayton Junction, BNSF Bayport Loop trains would turn south onto the UP Baytown Subdivision for approximately 2 miles to the CMC Railroad's Dayton Yard. CMC is currently expanding their Dayton facility in order to accommodate existing BNSF traffic moving to and from Baytown, Houston, and Silsbee. The UP Baytown Subdivision has a maximum operating speed of 10 mph between Dayton Junction and a point one-half mile south of the CMC Dayton Yard. All train movements are made under yard limit rules. UP also utilizes the CMC Dayton Yard and operates an average of 7.7 trains per day over the Baytown Subdivision. BNSF currently operates an average of 7.2 trains per day over the Baytown Subdivision. The daily routing of the two proposed BNSF Bayport Loop trains is expected to have a negligible impact upon train operations over the Baytown Subdivision given the estimated capacity of 18 to 20 trains per day.

4.1.2.2 No-Build Alternative

Under the No-Build Alternative, some Bayport Loop traffic would continue to travel via UP trains over the Strang Subdivision to various destinations and an average of 72 to 132 cars per day would travel via two BNSF trains over the same route. Most of the line is equipped with CTC, but Automatic Block Signals and Yard Limit operations are in effect between Deer Park

and the Strang Yard. If the proposed 36 to 66 loaded cars per day (72 to 132 cars total) are moved from the UP to BNSF trains, then the UP would probably need to reduce operational expenses in order to offset the lost revenue. Because UP handles a considerable amount of traffic for other customers that also passes through Strang Yard, it is probable that two trains would not be immediately eliminated to offset the loss of 72 to 132 cars. Existing trains would be operated with fewer cars. UP might reduce the number of trains handling Bayport Loop traffic on certain days only. For example, one or two trains that currently operate 6 or 7 days per week might get cut back to 4 or 5 days per week in order to reduce operating expenses. The capacity of the Industrial Lead is at least 12 to 14 trains per day and 7.4 trains currently operate over the line. The capacity of the Strang Subdivision from Strang Yard to Pasadena Junction ranges from 30 to 50 trains per day (30 from Strang Yard to Deer Park and 50 from Deer Park to Pasadena Junction) and 12.1 trains per day currently operate over the line. The capacity of the Strang Subdivision from Pasadena Junction to Sinco Junction is at least 50 trains per day and 20.1 trains per day currently operate over the line. From Sinco Junction to Tower 30, the Strang Subdivision can accommodate at least 50 trains per day between Sinco and Manchester Junctions and 15 to 16 trains per day between Manchester Junction and Tower 30, and 13.1 trains currently operate over the line. Therefore, the two additional trains from the No-Build Alternative would have a negligible impact on rail operations over the Bayport Loop, the Bayport Loop Industrial Lead, the Strang Subdivision, and the other rail lines to CMC Dayton Yard.

4.1.2.3 No-Action Alternative

Under the No-Action Alternative, UP would continue to operate as the sole rail carrier providing service to and from the Bayport Loop. There would be no change in effects on rail operations from those described under existing conditions in Section 3.1.

4.1.3 Impact Analysis – Rail Operations Safety

4.1.3.1 Build Alternatives

Operations would consist of one inbound train from the CMC Dayton Yard and one outbound train from the Bayport Loop per day. Rail operations over the UP Baytown Subdivision and within the CMC Dayton Yard are controlled by Yard Limits that restrict speed and ensure a safe operating environment. Trains would travel on existing UP tracks for approximately 52 miles, as described in Section 3.1. The speed limit on the GH&H line is 20 mph between Tower 85 (at milepost 2.1) and milepost 9.6 and 35 mph between mileposts 9.6 and 15.9 (Graham Siding). The speed limit between Tower 85 and Tower 87 on the East Belt is also 20 mph. The 20 mph maximum speeds are in consideration of the railroad junctions and track connections located along the lines. While the speed limits between Tower 87 and Dayton are much higher at 50 and 60 mph, the route has segments of double track and CTC signaling. In the past, this former SP route has accommodated much higher traffic volumes operating in both directions. The addition of two BNSF trains per day, on average, to these lines would have a negligible effect on rail operations safety. Based on the operating speeds, current traffic levels, the train signaling and control methods employed on these lines, the relatively small increase in train traffic, and the existing safety features of the lines, SEA concluded that the addition of two trains per day could be accommodated easily without affecting safety. Moreover, normal daily train traffic currently

operating on a given line can fluctuate by several trains per day due to seasonal traffic, dispatching decisions, and the economy in general.

Each of the Build Alternatives requires the construction of a new rail line from the GH&H line to the Bayport Loop. This new track would be constructed to meet FRA and railroad standards for operational safety. While operating over the proposed new line, BNSF would comply with a provision of the General Code of Operating Rules developed by the railroad industry and approved by FRA that requires trains to move at a speed that allows them to stop within half the range of vision. This would mean being able to stop short of trains, engines, railroad cars, personnel, or equipment fouling the track, stop signals or a derail or improperly lined switch. BNSF locomotives would move rail cars over the lines to and from the Bayport Rail Terminal. Older road locomotives that have been re-assigned to switching service would move the BNSF supplied cars to and from customers in the Loop.

The maximum speed for operations within the Bayport Loop would be limited to 10 mph. The proposed new BNSF tracks from the Bayport Rail Terminal to serve the facilities owned by ATOFINA, Basell, Equistar, and Lyondell would cross existing UP tracks at 12 to 16 locations depending upon the actual alignment chosen. The Applicants and UP have agreed that stop signs would be used at ten to 13 of these rail/rail crossings and stop signs and gates at two or three of the crossings. The provision of rail/rail stop signs and gates to be observed by the Bayport Rail Terminal and the UP railroad, with joint operating rules for both railroads, would provide a safe process to switch cars within the Bayport Loop. This is a typical arrangement for industrial switching operations.

All speed limits on rail lines are enforced by a system of operating rules developed by each railroad and approved by FRA. Railroad supervisors or division superintendents check rail operations to ensure that all speed limits and other safety measures and operating rules are being observed. The FRA also employs operating rules inspectors to make field inspections of rail operations. All locomotive engineers must be certified to FRA standards before they can operate a locomotive. Engineers also undergo an annual recertification. These safety measures would all apply to the proposed new rail line.

Overall, SEA concluded that because of the distances traveled daily by BNSF trains at slow train speeds or operation under proven signal systems, the BNSF dedicated track within the Bayport Loop, the use of joint operating rules and the strong regulatory environment in which the railroads operate, negligible direct or indirect impacts on rail operations safety would occur because of this project.

4.1.3.2 No-Build Alternative

As discussed earlier, the No-Build Alternative could allow BNSF to operate over the UP lines in the Bayport Loop and the SH 146 and 225 corridors, over the GH&H line between Tower 30 and Tower 85, and over the East Belt, Terminal, Lafayette, and Baytown Subdivisions to Dayton. SEA concluded that the No-Build Alternative would have negligible effects on rail operations safety. This conclusion was based on the speed restrictions within the Bayport Loop and on UP's Bayport Loop Industrial Lead track and the speed restrictions and signals on the Strang, East

Belt, Terminal, Lafayette, and Baytown Subdivisions, the control provided by the Spring Joint Dispatching Center, and the relatively small increase in train traffic that would result from implementation of the No-Build Alternative.

4.1.3.3 No-Action Alternative

Under the No-Action Alternative, UP would continue to be the sole rail carrier providing rail service to and from the Bayport Loop over its existing rail lines to and from Houston area yards, including Englewood, Settegast, Spring, and Galveston. There would be no change in effects on rail operations safety over those described under existing conditions in Section 3.1.

4.2 HAZARDOUS MATERIALS TRANSPORTATION SAFETY

4.2.1 Methodology

This section presents a summary of the method used by SEA to determine the predicted frequency and consequences of a release of hazardous materials during rail transportation resulting from the implementation of the Build Alternatives as well as the No-Build and No-Action Alternatives. Appendix D presents a detailed description of the method and the equations used by SEA, the underlying assumptions, and information about the hazardous materials that would likely be transported under the Proposed Action and Alternatives. SEA consulted with staff from the Hazardous Materials, Signal and Track Control, and Track Divisions of the FRA's Office of Safety Assurance and Compliance as part of the process of conducting the analyses for safety of hazardous materials transportation by rail.

Risk assessment is a process for identifying and determining both the likelihood of occurrence and the potential consequences of undesirable events, including releases of hazardous materials. Risk assessments allow decision-makers to consider both the severity of an event and its likelihood of occurrence, not just the worst case consequences, however unlikely they may be. In summary, the key concept to remember is:

Risk considers both likelihood of occurrence and potential consequences.

Quantitative risk assessments use engineering evaluations and mathematical techniques to develop estimates of both potential consequences and event frequencies, and then combine these to develop estimates of risk. The quantification of risk provides a means to compare different Alternatives, and to assess whether projects add substantially to risks that are already present. Risk assessments may focus on chronic or acute risks. Acute risks are those associated with episodic or short-term events, such as releases from transportation accidents. Chronic risks are those related to long-term exposures to hazards such as emissions or groundwater contamination.

There are many different hazardous materials that may be transported by rail in the project area – some highly flammable, some very toxic, and others not posing hazards beyond the immediate area of the release. The set of hazardous materials identified by the Applicants as likely to be transported over the Build Alternatives forms the basis of the hazardous materials transportation safety analysis. The hazardous materials identified for transport are based on the

Applicants' market analysis and corresponds to the types of hazardous materials commodities that the Applicants reasonably expect to capture. These hazardous materials represent a wide range of potential hazards.

SEA calculated the likelihood of a release of hazardous materials as a result of a potential derailment or collision, or other accidents that may lead to derailments, along a rail line. SEA used various inputs, including characteristics of the rail lines and trains, as well as safety statistics for different types of accidents, such as derailments, collisions, and other accidents. The fact that not all accidents result in releases of hazardous materials is of particular importance for the Build Segments, where the operating speeds would be restricted to 20 mph (10 mph within the Bayport Loop itself), thus reducing the chance of a release compared to operations at higher speeds. The analysis considered both project-specific details (number of trains, number of cars, route length, etc.) and track-class-specific national statistics indicating the likelihood of accidents per mile and the fraction of each type of accident that results in a derailment. The analysis produced estimates of the likelihood or chance of a release for the various Alternatives.

SEA assessed the potential public safety consequences in the event of a release of hazardous materials during rail transportation resulting from the implementation of the Proposed Action and Alternatives. An assessment of potential consequences typically involves four basic steps: (i) identification of the hazardous materials expected to be transported and their hazardous characteristics; (ii) determination of the extent of the area potentially affected; (iii) determination of the population in the area potentially affected; and (iv) assessment of the nature and magnitude of the potential consequences.

SEA assumed that a release of hazardous materials into the environment as a result of a rail accident potentially would lead to human exposure of relatively short duration. The duration of a release is limited by the volume in the railcar. Also, the emergency response teams on the scene would contain and clean up any release within a relatively short time as a result of knowing the exact point of release and the timely implementation of existing local, state, and Federal clean-up regulations. Therefore, SEA's analysis focused on acute toxicity (i.e., toxicity typically associated with short-term exposure, which results in toxic effects that are typically experienced immediately or within days of exposure), rather than on chronic toxicity (i.e., toxicity typically resulting from repeated or long-term exposure, which results in toxic effects that are typically detected after months or years of exposure).

SEA also considered the potential impacts to water and biological resources in the study area if a release of a hazardous material occurred to the environment. SEA considered the characteristics of the hazardous and other materials that would potentially be transported under the Proposed Action and Alternatives and the potential effect to the natural environment in the case of a release. The evaluation focused on water resources – including groundwater, surface waters, flood plains, and wetlands – because they may be the most sensitive natural resource and are typically the most susceptible to immediate impact from a release. Potential soil contamination would be limited by the prompt containment and clean-up of a spill. Moreover, the implementation of appropriate actions in the event of a release to surface water – such as cleaning up the spill and/or temporarily restricting the use of the water body – would minimize

the potential for longer-term impacts through unrecognized soil or water contamination. Thus, such impacts were not addressed for hazardous materials releases.

4.2.2 Impact Analysis

The subsections that follow first discuss the likelihood or chance of a release under the Proposed Action and Alternatives, including the No-Action and No-Build Alternatives. The potential consequences of such releases are then discussed for each Alternative. Lastly, the overall risk – considering both the estimated frequencies and the potential consequences of a release – is discussed for each Alternative.

4.2.2.1 Frequency of Release

Based on the information provided by the Applicants[2] and verified by SEA regarding expected rail activity on the Proposed Action and Alternatives, SEA selected two cases for analysis, as follows:

Project initiation:

- Two trains per day.
- 36 railcars per train (includes loaded and unloaded railcars).
- 1,500 loaded hazardous materials railcars per year (equivalent to an average of 6 percent of all railcars in each train).

Future market capture projection:

- Two trains per day.
- 66 railcars per train (includes loaded and unloaded railcars).
- 7,000 loaded hazardous materials railcars per year (equivalent to an average of 15 percent of all railcars in each train).

SEA evaluated each of the Alternatives under each of these scenarios, except for the No-Action Alternative, which was analyzed based on existing conditions. For the Build Alternatives and the No-Build Alternative, SEA analyzed the likelihood of a release of hazardous materials associated with the transportation of these materials between the Bayport Loop and the CMC Dayton Yard. As discussed in Chapter 2, based on information available to SEA, it appears that most of the inbound and outbound hazardous materials associated with the Bayport Loop and currently transported via rail by UP, travel between the Bayport Loop and Tower 30. Additionally, it appears that under current conditions, a large portion of this traffic also travels between Tower 30 and Tower 85 on its way to Settegast Yard or other destinations. Therefore, for the No-Action Alternative, SEA analyzed the likelihood of a release of hazardous materials between the Bayport Loop and Tower 85. The most densely populated area in the project area (where the maximum

[2] As indicated in Section 2.2, the Applicants' estimate of the volume of hazardous materials traffic includes glycols, which are considered hazardous materials under USEPA regulations, but not under USDOT regulations (and therefore are not included in USDOT's waybill data).

consequences could occur under very specific circumstances) is located along the rail segment between Tower 30 and Tower 85. For the No-Action Alternative, SEA performed a preliminary assessment of other routes that railcars transporting hazardous materials to and from the Bayport Loop may travel along in the vicinity of the rail segment between Tower 30 and Tower 85. SEA concluded that it was appropriate to extend the analysis of the No-Action Alternative to Tower 85 in order to include that rail segment based on the available information suggesting that a large portion of the existing rail traffic to and from the Bayport Loop travels along that particular rail segment, which is also a high population density area.

Build Alternatives. This section presents the results of SEA's analysis to estimate the frequency of a hazardous materials release taking place following the implementation of the Build Alternatives. A summary of the results of SEA's analysis is presented in Table 4.2-1. The frequencies given are for the entire route or segment mentioned, not just one location along the route. For example, for the Proposed Action or Alternative 1C between the Bayport Loop and the CMC Dayton Yard, SEA estimated that under the project initiation scenario, the accident frequency would be approximately 0.51 accidents per year (i.e., accidents that may or may not involve hazardous materials or the release of such materials), while the estimated release frequency would be approximately 0.058 releases per year. This calculated release frequency can be translated into a chance of approximately one in 17 of a release taking place in any given year somewhere along the route of this Alternative.

The analysis is based on safety statistics derived from historical data on hazardous materials releases resulting from derailments, collisions, and other accidents that may lead to derailments, as well as on market capture projections provided by the Applicants. Typically there would not be a release in the event of an accident because of the relatively low speed (i.e., maximum of 20 mph) at which trains would travel along a Build Segment and the fact that railcars used for transportation of hazardous materials are designed to withstand various types of impacts, especially at low speeds. Even if there were a release, most releases would be small as a result of the low operating speed and of the design standards applicable to the railcars; thus the consequences of a release are unlikely to be severe. Other key points are:

- Because the differences in length among the different Build Segments considered are relatively small (i.e., 12.8 miles for the Proposed Action; 13.2 miles for Alternative 1C; 13.8 miles for Alternative 2B; and 13.5 miles for Alternative 2D), SEA used the same length, 13.8 miles, for all analyses of the new construction. The use of the longest Alternative in the analysis is a conservative assumption.

- The outbound train leaving the Bayport Loop would carry loaded railcars, while the inbound train, originating at the CMC Dayton Yard, would carry mostly empty railcars. SEA assumed that the distribution of loaded cars between the two trains has only a minor influence on the risk calculations.

- SEA estimated the frequency of release along the complete route of the Build Alternatives as the sum of the frequencies of release calculated for the Build Segments, the GH&H line, the East Belt Subdivision, the Terminal Subdivision, the Lafayette Subdivision, and the Baytown Subdivision. SEA's analysis for the GH&H line considered two segments for analysis,

Table 4.2-1
Summary of Estimated Train Accident and Hazardous Materials Release Frequencies and Intervals Between Releases Under the Build Alternatives

Route	Length (mi)	Existing Conditions			Project Initiation			Future Market Capture Projection		
		Accident Frequency (derailments/ year)	Release Frequency (releases/ year)	Interval Between Releases (years)	Accident Frequency (derailments/ year)	Release Frequency (releases/ year)	Interval Between Releases (years)	Accident Frequency (derailments/ year)	Release Frequency (releases/ year)	Interval Between Releases (years)
Build Segments only	13.8	0	0	-	0.041	0.0013	750	0.062	0.0064	160
Proposed Action or Alternative 1C – Complete Route to CMC Dayton Yard	65.8 [52.0]*	0.44	0.051	20	0.51	0.058	17	0.56	0.071	14
Alternative 2B/2D – Complete Route to CMC Dayton Yard	63.3 [49.5]*	0.43	0.051	20	0.51	0.058	17	0.55	0.069	14
Existing Route – UP Route between Bayport Loop and Tower 85	27.6	0.46	0.036	28	0.42	0.037	27	0.38	0.030	33

* Under existing conditions, the length of the route for the Proposed Action or Alternative 1C and for Alternatives 2B and 2D does not include the 13.8 mile Build Segments. Accordingly, the accident and hazardous materials release frequencies for those routes under existing conditions correspond to the accident and hazardous materials release frequencies associated with the current rail operations along those segments of these routes that already exist (i.e., all but the new Build Segments).

because of the different locations at which the various Build Segments would join the GH&H line. The full segment of the GH&H line runs northwest from the vicinity of Ellington Field, at Graham Siding, to Tower 85. This full segment is relevant to the Proposed Action and Alternative 1C. The shorter segment starts approximately 2.5 miles northwest of Graham Siding, near the intersection of the GH&H line with Beltway 8, and runs northwest to Tower 85. This shorter segment is relevant to Alternatives 2B and 2D.

- Because the Applicants would be the only operators along the selected Build Segment, with two trains per day planned, and because no crossings of other rail lines would exist along that line west of the Bayport Rail Terminal yard, SEA assumed that accidents involving collisions between trains along that segment would not be expected, while such accidents would be possible inside the Bayport Loop, east of the Bayport Rail Terminal. Therefore, SEA's analysis of the likelihood of release of hazardous materials along the 13.8-mile proposed line considered two segments, a 6.2-mile segment east of the Bayport Rail Terminal and a 7.6-mile segment west of the Bayport Rail Terminal. Derailments were considered as the only type of potential incident on the western portion of the line, given that only one train is expected to operate on that portion of the line at any one time, while both collisions and derailments were evaluated for the eastern portion.

- Under the Build Alternatives, a reduction in rail activity (i.e., in the number of railcars transported along the line) is expected on the rail lines that UP currently uses for Bayport Loop traffic as a result of the diversion of current traffic to the Build Alternatives. Similarly, an increase in rail activity is expected on the GH&H line (i.e., an increase in rail cars and in hazardous materials traffic between Ellington Field and Tower 30, and an increase in the number of trains north of Tower 30), the East Belt Subdivision, the Terminal Subdivision, the Lafayette Subdivision, and the Baytown Subdivision as a result of the implementation of the Build Alternatives.

- SEA estimated the frequency of release along the UP routes between the Bayport Loop and Tower 85 by breaking this route into segments. The specific conditions for each segment were used in the analyses. Appendix D presents the results for the individual segments.

- A summary of the changes in accident and release frequencies for different routes after implementation of the Build Alternatives is presented in Table 4.2-2. For example, for the Proposed Action or Alternative 1C between the Bayport Loop and the CMC Dayton Yard, SEA determined that, under the conditions of the project initiation scenario, the estimated change in accident frequency would be approximately 0.079 accidents per year (i.e., accidents that may or may not involve hazardous materials or the release of such materials), while the change in release frequency would be approximately 0.0070. Under existing conditions, the likelihood of release of hazardous materials along the Build Segments is zero, given that there are no existing rail lines. Therefore, for the Build Segments, the change in accident and release frequency is equal to the respective accident and release frequencies under the project initiation and future market capture projection scenarios presented in Table 4.2-1.

Table 4.2-2
Summary of Changes in Train Accident and Hazardous Materials Release Frequencies Under the Build Alternatives Compared to Existing Conditions

Route	Length (mi)	Project Initiation		Future Market Capture Projection	
		Change in Accident Frequency (derailments/ year)	Change in Release Frequency (releases/ year)	Change in Accident Frequency (derailments/ year)	Change in Release Frequency (releases/ year)
Proposed Action and Alternative 1C – Complete Route to CMC Dayton Yard	65.8 [52.0]*	0.079	0.0070	0.12	0.019
Alternative 2B/2D – Complete Route to CMC Dayton Yard	63.3 [49.5]*	0.077	0.0069	0.12	0.019
Existing Route – UP Route between Bayport Loop and Tower 85	27.6	-0.048	0.0012	-0.087	-0.0052

* See note on Table 4.2-1.

The results of SEA's analysis showed that for the project initiation scenario, as well as for the future market capture projection, the implementation of the Build Alternatives would cause a small increase in the likelihood of release of hazardous materials. For example, for the Proposed Action or Alternative 1C, the change in hazardous materials release frequency of 0.0070 releases per year can also be expressed as a change in the chance of a release: while under existing conditions the release frequency was roughly equivalent to a chance of one in 20 that a release would occur in any given year somewhere along the route, under the project initiation scenario the release frequency was roughly equivalent to a chance of one in 17 in any given year somewhere along the route.

Safety statistics and operations data information were not available for UP's train yards in the Houston area, for the CMC Dayton Yard north of Baytown, or for the Bayport Rail Terminal located west of the Bayport Loop. Given that railcar traffic on the Strang Subdivision and on other lines used by UP to transport commodities, including hazardous materials, in and out of the Bayport Loop would be expected to be reduced as a result of the implementation of the Proposed Action, SEA estimated that a commensurate reduction in the volume of rail activity at UP's rail yards in the Houston area also would be expected. A commensurate increase in the volume of rail activity is expected at the CMC Dayton Yard. In the absence of safety statistics and operations data for UP's yards and for the CMC Dayton Yard, it is not possible to estimate the degree of reduction or increase of the likelihood of a hazardous materials release at those facilities. However, any change should be small, given the total volumes of hazardous materials handled and the relatively small change in rail activity that would result after implementation of the Proposed Action or Alternatives.

A letter from the City of Houston dated February 1, 2002, commented on potential security impacts associated with location of a railroad in close proximity to an airport operating area fence. The comment refers to the Proposed Action and Alternative 1C. The comment asked that

the FAA and the new Transportation Safety Administration (TSA) review this portion of the proposed project. FAA is a cooperating agency in the preparation of this Draft EIS. SEA contacted the TSA to inform them of the Proposed Action. The Federal Security Director for Ellington Field was briefed by his staff and in turn notified TSA headquarters of the Proposed Action and Alternative 1C. TSA indicated that the situation is not of immediate concern.

No-Build Alternative. For the purposes of the analysis for the No-Build Alternative (between the Bayport Loop and the CMC Dayton Yard), SEA assumed that the number of trains per day operated by UP along the segments of the UP Strang Subdivision and other UP lines that are part of the No-Build Alternative would remain unchanged as a result of the implementation of the No-Build Alternative, while BNSF would operate two trains per day along these lines. It should be pointed out that it is possible that UP may decide to slightly reduce its rail activity along those rail lines.

Table 4.2-3 presents a summary of the results of SEA's analysis for the No-Build Alternative. For example, SEA determined that under the project initiation scenario, the accident frequency would be approximately 0.91 accidents per year (i.e., accidents that may or may not involve hazardous materials or the release of such materials), while the release frequency would be approximately 0.093 per year. This calculated release frequency can be expressed as one chance in 11 of a release in any given year somewhere along the route of this Alternative.

Table 4.2-4 presents a summary of the changes in accident and release frequencies after implementation of the No-Build Alternative. For example, SEA determined that, under the conditions of the project initiation scenario, the estimated change in accident frequency would be approximately 0.056 accidents per year (i.e., accidents that may or may not involve hazardous materials or the release of such materials), while the change in release frequency would be approximately 0.011 releases per year.

The results of SEA's analysis showed that for the project initiation scenario, as well as for the future market capture projection scenario, the implementation of the No-Build Alternative would cause a negligible change in the likelihood of release of hazardous materials.

No-Action Alternative. Table 4.2-5 presents a summary of the results of SEA's analysis for the No-Action Alternative. The accident and release frequencies are those associated with the UP, BNSF, and PTRA traffic along the relevant rail lines between the Bayport Loop and Tower 85 under existing conditions.

4.2.2.2 Consequences of Release

The potential consequences of a release are quite varied, depending on the accident location, the amount released, the material released and the weather conditions at the actual time of the release. Releases that are small, occur in less populated areas, ignite early on in their development, or involve less hazardous materials, will have fewer consequences. To be conservative, SEA's analysis focused on worst case consequences. However, to actually experience the worst case consequences, the release must occur in the worst case location, the

Table 4.2-3
Summary of Estimated Train Accident and Hazardous Materials Release Frequencies and Intervals Between Releases Under the No-Build Alternative

Route	Length (mi)	Existing Conditions			Project Initiation			Future Market Capture Projection		
		Accident Frequency (derailments/ year)	Release Frequency (per year)	Interval Between Releases (years)	Accident Frequency (derailments/ year)	Release Frequency (per year)	Interval Between Releases (years)	Accident Frequency (derailments/ year)	Release Frequency (per year)	Interval Between Releases (years)
No-Build Alternative - Between Bayport Loop and CMC Dayton Yard	63.4	0.86	0.082	12	0.91	0.093	11	0.93	0.097	10

Table 4.2-4
Summary of Changes in Train Accident and Hazardous Materials Release Frequencies Under the No-Build Alternative Compared to Existing Conditions

Route	Project Initiation		Future Market Capture Projection	
	Change in Accident Frequency (derailments/ year)	Change in Release Frequency (releases/ year)	Change in Accident Frequency (derailments/ year)	Change in Release Frequency (releases/ year)
No-Build Alternative - Between Bayport Loop and CMC Dayton Yard	0.056	0.011	0.070	0.014

Table 4.2-5
Summary of Calculated Train Accidents and Hazardous Materials Release Frequencies Under the No-Action Alternative

Route	Length (mi)	Accident Frequency (derailments/ year)	Release Frequency (per year)	Interval Between Releases (years)
No-Action Alternative - Bayport Loop to Tower 85	27.6	0.46	0.036	28

material released must be one of the materials of greatest concern, the release must be large (only a small percentage of releases are), the weather conditions must be such that the hazard area is maximized, and the release must fully develop and then ignite if a fire or explosion is the hazard of concern. These conditions were taken into account when SEA considered the overall risk of the Proposed Action and Alternatives.

For the purposes of the assessment of potential health consequences, SEA identified the most densely populated area along each particular segment on each route. SEA then calculated the total population that lives within a circle with a radius equal to the maximum protective action distance, based on the representative set of hazardous materials, for that particular segment in the most densely populated area. The use of a circle as the shape of the protective action area is a simplifying assumption that leads to a very conservative estimate of potential consequences. Furthermore, many materials have smaller protective action distances than that for the highest hazard material. Most important, as can be observed by reviewing the FRA's incident reports and safety statistics, the overwhelming majority of accidents that do have a release experience a small release, with a correspondingly small potential impact area. The fact that most releases resulting from accidents are small is, to a significant extent, the intended effect of adherence to FRA standards for car design.

For the purpose of the assessment of potential consequences to resources, SEA identified the location of water resources (e.g., surface waters and wetlands) and terrestrial habitats of particular significance. SEA also identified features of the resources (e.g., designation as an ecologically significant river and stream segment and essential fish habitat) relevant to consideration of the potential consequences.

For toxic substances, SEA's analysis focused on acute toxicity (i.e., toxicity typically associated with short-term exposure), rather than on chronic toxicity (i.e., toxicity typically resulting from long-term exposure). SEA also considered the bioaccumulation potential in the aquatic environment. For flammables, SEA considered the population located within the area potentially impacted by a fire.

Build Alternatives. The range of potential consequences from a hazardous materials release along the existing rail lines in the project area would not change under the Build Alternatives, given that no major change is expected in the types of hazardous materials transported along those lines. However, changes in potential consequences from a hazardous materials release are

expected along some areas of the Build Segments because there presently is no potential for a release from rail traffic in those areas. For the purposes of SEA's analysis, that population is potentially newly exposed to the risk of a hazardous materials release.

For the analysis of the potential public safety consequences associated with the Build Alternatives, SEA initially evaluated the potential consequences from hazardous materials releases in areas along the existing rail lines. For the existing rail lines, SEA considered the maximum number of people that could require evacuation due to a single event in a worst case scenario. Subsequently, SEA focused on the areas along the Build Segments that are not already at risk due to current activities involving transportation of hazardous materials on the existing Bayport Loop Industrial Lead, the Bayport Rail Terminal, or the GH&H line. This newly exposed population lives within a 1-mile corridor on either side of the Build Segments in those areas not already at risk from those other rail lines. For the Build Segments, SEA considered two issues in terms of consequences: the number of people that could be affected by a single event and the total number of people newly at risk along the Build Segments.

For the existing rail lines associated with the Build Alternatives, SEA calculated that the most densely populated area along the existing UP routes extending from the GH&H line at Ellington Field to the CMC Dayton Yard, is located east of Tower 85 along the GH&H line, north/ northeast of the intersection of Lawndale and Collier and south/south-west of the intersection of Navigation and South 65th Street.

For the newly exposed population along the Build Segments, SEA determined that for the Proposed Action and Alternative 1C, the most densely populated areas would be located east of the intersection of the Proposed Action or Alternative 1C and the GH&H line near Ellington Field (i.e., near the intersection of Clear Lake City Boulevard and Space Center Boulevard), while for both Alternatives 2B and 2D the most densely populated area would be located east of the intersection of Alternatives 2B and 2D and the GH&H line near the intersection of Genoa Red Bluff Road and Baywood Drive. Under a worst-case scenario involving a large release of a toxic (by inhalation) material at night, the population expected to be potentially newly exposed to the risk of a hazardous materials release that might be considered for evacuation if the worst case scenario occurred at these specific locations is given in Table 4.2-6. These figures reflect the maximum population located within the protective action distance from the release. However, if the wind direction was known and steady, the number of people of concern at any of this or other locations would be smaller because the full circle would not need to be used as the area of concern in such circumstances. Within the areas potentially affected by a release, the potential human impacts if people are not evacuated or do not shelter-in-place could range from minor irritation to injuries, or even a limited number of fatalities.

The actual consequences would depend on the accident location relative to populated areas, the amount and rate of release, the hazardous material involved, and the weather conditions at the time of the release.

For the total number of people newly at risk along the Build Segments, the concern is with the population that is not currently exposed to potential impacts associated with hazardous materials transportation via rail in the area. SEA determined that the additional population potentially

Table 4.2-6
Estimates of Population That Could Potentially be Evacuated Under a Worst Case Scenario of a Hazardous Materials Release Under All Alternatives

Route	Population Potentially Evacuated
Proposed Action and Alternative 1C – Complete Route to CMC Dayton Yard	0-30,000
Alternative 2B/2D – Complete Route to CMC Dayton Yard	0-30,000
Proposed Action – Build Segment Only	0-7,100
Alternative 1C – Build Segment Only	0-8,600
Alternative 2B – Build Segment Only	0-3,400
Alternative 2D – Build Segment Only	0-3,400
No-Build Alternative – Between Bayport Loop and CMC Dayton Yard	0-30,000
No-Action Alternative – Bayport Loop to Tower 85	0-30,000

bearing some level of risk as a result of the implementation of the Build Alternatives would be approximately 8,000 people for the Proposed Action, approximately 9,500 people for Alternative 1C, approximately 4,100 for Alternative 2B, and approximately 3,800 people for Alternative 2D. Not all of these people would be involved in a given incident were one to occur, because the area at risk for evacuation or harm would be focused around the specific point of release.

For the analysis of potential resource consequences (water and biological resources) associated with the Build Alternatives, SEA focused on the aquatic toxicity, danger to living resources (non-human), and bioaccumulation potential of the hazardous materials that would be transported over the new rail line. Information on these characteristics for each of the hazardous materials is provided in Appendix D.

Several of the hazardous materials proposed to be transported on the Build Segments under the Build Alternatives are classified as toxic to aquatic life in very low concentrations (e.g., flammable liquids). Other materials (e.g., alcohols) are classified as toxic to aquatic life only in very high concentrations. Several materials are classified as non-toxic to aquatic life and toxicity information is unknown or unavailable for a few materials. The methodology used to evaluate the consequences to biological resources (non-human) considers flammable liquids to be moderately toxic, while other materials are considered to be slightly toxic (e.g., ethylene oxide), practically nontoxic, or nonhazardous.

Styrene is known to potentially bioaccumulate in the food chain and potentially taint seafood in the event of a release to surface waters. All of the other hazardous materials proposed to be transported on the Build Segments are not known to bioaccumulate in the food chain if they are released into the environment. The materials typically ionize into nonhazardous constituents, volatilize or react with water, or they are metabolized or biodegraded. All of the materials are

expected to be transported downstream if they are spilled into water and are not immediately contained.

SEA anticipates that a release of hazardous materials into the environment would potentially lead to environmental exposure of relatively short duration based on the fact that the release would be contained/remediated within a relatively short time as required by local, state, and Federal requirements. Also, the duration of a release is limited by the volume in the railcar.

No-Build Alternative. For the No-Build Alternative, SEA calculated that the most densely populated area along the existing UP routes between the Bayport Loop and Tower 87 is located near Tower 85, at the same location as for the Build Alternatives (i.e., located north/northeast of the intersection of Lawndale and Collier and south/southwest of the intersection of Navigation and South 65th Street). (see Table 4.2-6)

The potential consequences for natural resources would be almost unchanged under the No-Build Alternative because the volume and type of hazardous materials shipments would be essentially the same as under current conditions and because the total volumes of hazardous materials currently handled along the No-Build Alternative are large relative to the hazardous materials rail activity that would result after implementation of that Alternative.

No-Action Alternative. For the No-Action Alternative, SEA calculated that the most densely populated area along the existing UP routes between the Bayport Loop and Tower 87 is located near Tower 85, at the same location as for the Build Alternatives and the No-Build Alternative (i.e., located north/northeast of the intersection of Lawndale and Collier and south/southwest of the intersection of Navigation and South 65th Street). (see Table 4.2-6)

The potential consequences for natural resources would be unchanged under the No-Action Alternative because the volume, type, and route of hazardous materials shipments would be the same as under current conditions.

4.2.2.3 Overall Risk

Risk is a function of both accident frequency and potential consequences, considering not only how severe an accident could be, but also how likely it is that any specific consequence would be experienced. In order to assess the overall potential risk associated with hazardous materials transportation, SEA considered the extent of the existing risk in the project area, as well as the extent of the incremental risk introduced as a result of the implementation of the Proposed Action and Alternatives. SEA also considered the existence of strong emergency response capabilities in the project area.

Build Alternatives. Based on the results presented above for the analysis of the predicted frequency of release of hazardous materials during rail transportation and for the assessment of potential consequences, SEA has determined that the overall risk associated with the Build Alternatives would be very low. SEA recognizes that some people and natural resources in the vicinity of the Build Segments do not currently bear any risk from the transportation of hazardous materials during transportation by rail because there are no existing rail lines near these people or

resources. However, the implementation of the Build Alternatives yields a very low predicted frequency of a release (one release in 160 to 750 years for the full length of the Build Segments, not any one specific location). Taking into account the chance of the release occurring in a densely populated area or near a sensitive natural resource (e.g., Armand Bayou), and given that most releases would be small and that not all of the hazardous materials traffic poses the same degree of hazard, the chance of a worst case consequence being realized is much lower than the overall chance of release. SEA has determined that this additional risk would be low, especially in comparison to the likelihoods of release under existing conditions.

No-Build Alternative. The existing risk levels would change minimally due to the No-Build Alternative, particularly because the volume of hazardous materials traffic in the project area is already large and only the distribution across routes would be modified by the No-Build Alternative.

No-Action Alternative. The existing risk levels would be unchanged under the No-Action Alternative because both the volume and type of hazardous materials traffic in the project area and the distribution across routes would not be modified.

4.3 PIPELINE SAFETY

4.3.1 Methodology

SEA considered the potential impacts of rail operations on pipeline safety by examining the likelihood and potential consequences of a pipeline release resulting from construction and operation of the Proposed Action and Alternatives, including the No-Action Alternative. SEA examined the likelihood and potential consequences of a pipeline release due to rail construction by using pipeline accident statistics available from the USDOT OPS in combination with information on the location of pipelines in the project area. SEA used accident statistics for the period 1985 through 2001 to estimate the frequency of potential construction accidents, expressed as the number of incidents per mile of natural gas or hazardous liquids pipeline.[3] SEA then combined the estimated frequency per mile with the estimated number of miles of new rail construction that would occur near pipelines to estimate the overall likelihood of a pipeline release resulting from a construction accident. SEA also used the same accident data in considering the potential consequences of such a release.

SEA evaluated the likelihood and potential consequences of a pipeline release due to rail operations based on a review of national pipeline accident statistics (see Appendix E) and a previous study of the issue. The previous study, conducted for the California State Fire Marshal following a train derailment in San Bernardino in 1989, evaluated the risk to pipelines from rail operations. SEA also examined the likelihood of rail operations resulting in a rail accident, using the estimated frequency of derailment (developed as part of the hazardous materials transportation analysis and described in more detail in Appendix D), the estimated percentage of

[3] SEA considered estimating the frequency in terms the number of incidents per 1,000 construction events, but data are not available to determine the number of times per year construction occurs near a natural gas or hazardous liquids pipeline.

the rail line that is in close proximity to a pipeline, and the available information on the effects of rail accidents on pipelines.

4.3.2 Impact Analysis

4.3.2.1 Build and No-Build Alternatives

Construction. The No-Build Alternative would not involve any construction. The Build Alternatives, which include the Proposed Action, would involve new rail line construction. OPS data indicate that on average there are 0.21 construction accidents per 1,000 miles of hazardous liquid pipeline each year. Similar data for gas pipelines indicate that on average there are 0.054 construction accidents per 1,000 miles of pipeline each year. These differences are due more to the size of the pipelines than to factors associated with the materials they transport - liquid lines are generally small in diameter and easier to damage if struck during construction activities. OPS data also indicate that nearly all of these accidents involved underground pipelines and a majority of these accidents occurred when the excavator did not check for the presence of a pipeline before digging.

As part of preliminary engineering for the proposed new rail construction, the Applicants identified pipelines in or near the proposed right-of-way for the Proposed Action. The resulting information indicates that approximately 1 mile of the new rail line construction associated with the Proposed Action would involve construction activities near a petroleum or chemical pipeline.[4] A similar amount of the new construction for the other Build Alternatives would also occur near pipelines, with the exception of the route involving the Original Taylor Bayou crossing that would involve construction of about 1.7 miles of rail line near pipelines. Assuming that pipeline construction accidents caused by a failure to check for the presence of a pipeline before digging are unlikely for the Build Alternatives and that construction would take approximately 1.5 years, SEA estimated the likelihood of a hazardous liquid pipeline construction accident to be approximately 0.00016 (one chance in 6,200) for all of the Build Alternatives except the Original Taylor Bayou crossing. For the Original Taylor Bayou crossing, SEA estimated the accident likelihood to be approximately 0.00027 (one chance in 3,700).

Data developed by the Applicants indicate that approximately 0.5 miles of the new rail line construction associated with the Proposed Action would involve excavation activities near a gas pipeline. A similar amount of the new construction for the other Build Alternatives would also occur near pipelines. Assuming that pipeline construction accidents caused by a failure to check for the presence of a pipeline before digging are unlikely for the Build Alternatives and that construction would take approximately 1.5 years, SEA estimated the likelihood of a hazardous gas pipeline construction accident to be approximately 0.00002, or one chance in 48,000.

Operation. Rail operations could potentially affect pipelines where they cross or are located near and parallel to the rail line as a result of excessive surcharge loading from train traffic or impact from a derailed rail car or locomotive. Based on a review of available pipeline accident

[4] For this analysis, SEA considered a pipeline within approximately 50 feet of the centerline of the proposed rail line to be near construction activities.

data from OPS and the RRC, SEA found no evidence of pipeline damage resulting from excessive surcharge loading due to rail operations. In addition, engineering design standards developed by AREMA and API and OPS requirements include provisions to protect pipelines from excessive loading when they are located near rail lines. Therefore, SEA concluded that the potential for pipeline damage from excessive loading from rail operations is negligible.

SEA evaluated the potential pipeline impacts resulting from rail accidents for the Proposed Action and Alternatives using the change in estimated rail accidents involving derailments, the proximity of aboveground pipelines to the routes that would be used by the Proposed Action and Alternatives, and available information on these effects of past rail accidents on pipelines. SEA estimated derailment frequency for the Proposed Action and Alternatives as the difference between the estimated frequency under existing conditions (presented in Section 3.3) and the estimated frequency for proposed operations under the Proposed Action and Alternatives (presented in Section 4.2). As shown in Table 4.3-1, the estimated derailment frequency increases, depending on the Alternative, by 0.056 to 0.079 per year for project initiation conditions and by 0.070 to 0.12 for projected future market capture. The development of these estimated derailment frequencies is described in Appendix D and the results are summarized in Table 4.3-1.

Table 4.3-1
Estimated Change in Accident Frequency (per Year)
Under Implementation of the Proposed Action or Alternatives

Route	Estimated Change in Derailments/Year at Initial Operating Conditions (36 carloads/day)			Estimated Change in Derailments/Year Assuming Projected Future Market Capture (66 carloads/day)		
	Existing Track	New Track	Total	Existing Track	New Track	Total
Proposed Action or Alternative 1C	0.038	0.041	0.079	0.060	0.062	0.12
Alternatives 2B or 2D	0.036	0.041	0.077	0.057	0.062	0.12
No-Build Alternative	0.056		0.056	0.070		0.070

Based on review of national data on rail and pipeline accidents from 1985 through 2001, SEA found that damage to pipelines from rail accidents, such as derailments, is extremely rare in the context of the thousands of reported accidents that occurred during this period. SEA did not identify any rail accidents during the period that directly caused a release from an underground pipeline. SEA found two rail accidents (in 1989 in Martinez, California and in 1998 in Cox Landing, West Virginia) that directly resulted in a release from an aboveground pipeline (NTSB, 1990 and 1999). In addition, SEA found three other instances (in San Bernardino and Montclair, California and Corpus Christi, Texas) in which a rail accident or subsequent cleanup-related activities caused pipeline damage (NTSB, 1990; RRC, 2001). In the two incidents in California, pipeline damage occurred during cleanup-related operations and was followed by a pipeline

release. In the incident in Texas, a derailment resulted in damage to an aboveground section of a pipeline but did not cause a release from the pipeline.

The estimated changes in accident frequencies shown in Table 4.3-1 apply to the entire length of each Alternative, but aboveground pipelines, which could be susceptible to damage in the event of an accident, only occur along small portions of the rail line. SEA estimated that aboveground pipelines occur along less than 0.3 miles (0.5 percent) of the route for each of the Build Alternatives. For the No-Build Alternative, SEA estimated that aboveground pipelines are located near approximately 0.5 miles (0.8 percent) of the route, primarily in the SH 225 corridor. In addition, a risk assessment conducted by the California State Fire Marshal following the San Bernardino accident covered approximately 7,800 miles of hazardous liquid pipeline and concluded that "the likelihood of a derailment resulting in pipeline rupture is extremely remote" (California State Fire Marshal, 1993). Finally, pipelines and railroads frequently occur in close proximity to each other and there are established engineering practices for use in these situations (AREMA, 2002; API, 1993).

In the extremely unlikely event of a pipeline release caused by a rail accident, OPS data indicate that the consequences of an incident involving a gas or hazardous liquids pipeline could include damage to property, fire, explosion, and personal injury or death. OPS data also indicate that only a small percentage of pipeline accidents that do occur result in serious consequences such as fire, explosion, or personal injury or death. Potential consequences associated with damage to other types of pipelines (e.g., water, sewage) would be much more limited (e.g., temporary disruption of service).

Based on the very low likelihood that rail operation would damage a pipeline and the relatively low probability that serious consequences would result even if such damage were to occur, SEA concluded that the impact of rail operations on pipeline safety would be minimal.

4.3.2.2 No-Action Alternative

Construction. The No-Action Alternative does not involve construction and so would not cause any construction-related impacts on pipelines.

Operation. As discussed above, for the Build and No-Build Alternatives, rail operations could potentially affect pipelines where they cross or are located near and parallel to the rail line as a result of excessive surcharge loading from train traffic or impact from a derailed rail car or locomotive. SEA concluded that the potential for pipeline damage from excessive loading from rail operations is minimal.

SEA estimated that under existing conditions the frequency of a derailment along the UP lines covered by the No-Action Alternative is 0.46 derailments per year. SEA concluded, however, that for reasons similar to those described for the Build and No-Build Alternatives, the likelihood that a derailment would cause a release from a pipeline is extremely low. In the unlikely event of a pipeline release, SEA anticipates that the potential consequences also would be essentially the same as those described above for the Build and No-Build Alternatives.

Based on the very low likelihood that rail operation would damage a pipeline and the relatively low probability that serious consequences would result even if such damage were to occur, SEA concluded that the impact of rail operations on pipeline safety is minimal.

4.4 GRADE CROSSINGS DELAY AND SAFETY

4.4.1 Methodology

SEA evaluated the consequences of the Proposed Action and Alternatives on delay and safety conditions at grade crossings. SEA reviewed the existing traffic delay and safety conditions associated with the existing rail lines that would be used under the Proposed Action and Alternatives. SEA also conducted field surveys within the project area and consulted with TxDOT to discuss and identify any transportation delay and safety concerns at grade crossings in the project area.

SEA conducted its grade crossings analysis in accordance with USDOT's Federal Highway Administration guidelines. These guidelines take into account the frequency of trains at grade crossings, volume of traffic, existing safety devices at grade crossings, and other factors to determine the potential impacts of an increase in rail traffic. Further information on SEA's grade crossings analysis methodology can be found in Appendix F.

4.4.2 Impact Analysis – Traffic Delay

4.4.2.1 Proposed Action and Alternatives

Build Alternatives. Due to variation in rail traffic for different segments, SEA divided the Build Alternatives into segments of uniform rail traffic. For the Build Alternatives, SEA evaluated traffic delays on the GH&H line south of Tower 30, and at segments between Tower 30 to Tower 85, Tower 85 to Tower 87, Tower 87 to Dayton Junction, and at five new grade crossings (Old State Highway 146, Port Road, the northbound entrance and southbound exit ramps to State Highway 146 at Port Road, and Bay Area Boulevard) from the turnout on the GH&H line through the Bayport Loop. The number of trains and Level of Service (LOS) for each segment is described in Table 4.4-1. The analysis results are the same for all of the Build Alternatives.

SEA's traffic delay analysis showed that the LOS would not decrease at any grade crossing as a result of the Build Alternatives. All the existing grade crossings show LOS A or B for both existing and proposed conditions, with the exception of one crossing with LOS C under both existing and proposed conditions. The increase in average delay per vehicle for the existing grade crossings under the Build Alternatives would range from 0.1 to 0.9 seconds.

The average delay per vehicle for the five new grade crossings under the Build Alternatives, would range from 0.4 to 6.7 seconds.

Appendix F presents the location and use of each grade crossing, the crossing delay per stopped vehicle, average delay for all vehicles, and the change in average delay for all vehicles for existing and proposed conditions under the Build Alternatives.

Table 4.4-1
Traffic Delay Analysis of Grade Crossings for Build Alternatives

Segments	TRAINS PER DAY		TRAFFIC LOS	
	Existing	Proposed	Existing	Proposed
Within Bayport Loop	10.5	12.5	A**	A**
Build Segment (Loop to GH&H)	0	2	N/A	A
GH&H line (South of Tower 30)	3.4	5.4	A	A
Tower 30 to Tower 85	5	7	A	A
Tower 85 to Tower 87	25.1	27.1	B*	B*
Tower 87 to Dayton Junction	20.7	22.7	A	A
Dayton Junction to CMC Dayton Yard	14.9	16.9	B	B

* C for one crossing.
** B for one crossing.

No-Build Alternative. SEA evaluated traffic delays on the Bayport Loop and Industrial Lead, the Strang Subdivision, and the segments from Tower 30 to Tower 85, Tower 85 to Tower 87, and Tower 87 to Dayton Junction. The number of trains and LOS for each segment for this Alternative is described in Table 4.4-2.

SEA's traffic delay analysis showed that the LOS would decline (from B to C) for one grade crossing as a result of this Alternative. All other grade crossings show the same LOS (A or B for all but one crossing, which is C) for existing and proposed conditions. The increase in average delay per vehicle from the existing to the proposed conditions would range from 0.1 to 1.4 seconds.

Appendix F presents the location and use of each grade crossing, the crossing delay per stopped vehicle, average delay for all vehicles, and the change in average delay for all vehicles for existing and proposed conditions under the No-Build Alternative.

Based on traffic delay analysis for all grade crossings, SEA concluded that the Build and No-Build Alternatives would have negligible impacts on traffic delay at grade crossings.

No-Action Alternative. SEA analyzed the traffic delay impacts under the No-Action Alternative due to existing traffic at grade crossings. The analysis covered the Bayport Loop Industrial Lead to Strang Yard. Because no new construction or changes in rail operations would occur, no delay impacts are expected to result from the No-Action Alternative. All grade crossings showed LOS of A or B. The average delay per vehicle for the existing conditions range from 1.8 to 6.2 seconds for all grade crossings.

Table 4.4-2
Traffic Delay Analysis of Grade Crossings for No-Build Alternative

Segments	TRAINS PER DAY		TRAFFIC LOS	
	Existing	Proposed	Existing	Proposed
Bayport Loop	10.5	12.5	A/B	A/B
Bayport Loop Industrial Lead	7.4	9.4	A	A
Strang Subdivision (Yard to Pasadena J)	12.1	14.1	A	A
Strang Subdivision (Pasadena J to Sinco J)	20.1	22.1	B	B
Strang Subdivision (Sinco J to Tower 30)	13.1	15.1	A/B	A/B*
Tower 30 to Tower 85	5	7	A	A
Tower 85 to Tower 87	25.1	27.1	B**	B**
Tower 87 to Dayton Junction	20.7	22.7	A	A
Dayton Junction to CMC Dayton Yard	14.9	16.9	B	B

* One crossing with LOS B under existing conditions is calculated to have LOS C under proposed conditions.

** C for one crossing.

4.4.3 Impact Analysis – Grade Crossing Safety

4.4.3.1 Proposed Action and Alternatives

Build Alternatives. SEA's grade crossing safety analysis showed that predicted accident frequency under existing conditions on the rail lines that would be used as part of the Build Alternatives ranged from 0.0030 to 0.137. Following implementation of the Proposed Action or other Build Alternatives, the predicted accident frequency would range from 0.0032 to 0.151. This translates into one accident every 333 to seven years for existing conditions and 313 to seven years for the proposed conditions, depending on the crossing.

The predicted accident frequency under existing conditions on the GH&H line south of Tower 30 ranged from 0.004 to 0.137. Following implementation of the Proposed Action or other Build Alternatives, the predicted accident frequency would range from 0.005 to 0.151. This translates into one accident every 250 to seven years for existing conditions and 200 to seven years for the proposed conditions, depending on the crossing.

The predicted accident frequency under existing conditions on the GH&H line between Tower 30 and Tower 85 ranged from 0.009 to 0.052. Following implementation of the Proposed Action or other Build Alternatives, the predicted accident frequency would range from 0.011 to 0.057.

This translates into one accident every 111 to 19 years for existing conditions and 91 to 18 years for the proposed conditions.

The predicted accident frequency under existing conditions between Tower 85 and Tower 87 ranged from 0.011 to 0.099. Following implementation of the Proposed Action or other Build Alternatives, the predicted accident frequency would range from 0.011 to 0.101. This translates into one accident every 91 to ten years for existing conditions and 91 to ten years for the proposed conditions.

The predicted accident frequency under existing conditions between Tower 87 and CMC Yard ranged from 0.0030 to 0.131. Following implementation of the Proposed Action or other Build Alternatives, the predicted accident frequency would range from 0.0032 to 0.134. This translates into one accident every 333 to eight years for existing conditions and 313 to seven years for the proposed conditions.

For the new grade crossings at Old State Highway 146, Port Road, access ramps to SH 146, and Bay Area Boulevard, TxDOT would determine the appropriate level of grade crossing protection based on Federal and state regulations and guidelines. For the new grade crossings, accident frequency rates for the existing and the proposed conditions cannot be calculated using the USDOT accident formula due to an absence of accident history information. However, SEA realizes that accidents would be possible at these new grade crossings in the future. Thus, SEA and the Applicants consulted with TxDOT, and TxDOT indicated that gates and flashers at the new crossings would probably be required.

Appendix F presents the location of each grade crossing, and the change in predicted accident frequency for existing and proposed conditions under the Proposed Action.

No-Build Alternative. SEA's grade crossing safety analysis showed that predicted accident frequency under existing conditions on the rail lines that would be used as part of the No-Build Alternative ranged from 0.0030 to 0.131. Following implementation of the No-Build Alternative, the predicted accident frequency would range from 0.0032 to 0.134. This translates into one accident every 333 to eight years for existing conditions and 313 to seven years for the No-Build Alternative, depending on the crossing.

The predicted increases in accident frequency under existing conditions on the Strang Subdivision ranged from 0.0039 to 0.105. Following implementation of the No-Build Alternative, the predicted accident frequency would range from 0.0042 to 0.108. This translates into one accident every 256 to ten years for existing conditions and 238 to nine years for the No-Build Alternative.

The predicted increases in accident frequency under existing conditions on the Bayport Loop Industrial Lead ranged from 0.018 to 0.074. Following implementation of the No-Build Alternative, the predicted accident frequency would range from 0.019 to 0.076. This translates into one accident every 56 to 14 years for existing conditions and 53 to 13 years for the No-Build Alternative

The predicted increases in accident frequency for grade crossings between Tower 30 and Dayton Junction are the same as those described under the Build Alternatives.

Appendix F presents the location of each highway/rail at-grade crossing, and the predicted accident frequency for existing and proposed conditions under the No-Build Alternative.

Based on traffic safety analysis for all highway/rail at-grade crossings, SEA concluded that the predicted increases in accident frequency would have negligible impacts on traffic safety at crossings.

SEA consulted with TxDOT on grade crossings safety and TxDOT proposed gates and flashers for all new crossings. TxDOT noted that the traffic safety devices for existing crossings appear adequate and that there would not be any significant traffic safety impacts at grade crossings due to the proposed increase in rail traffic and operations.

No-Action Alternative. Because no new construction or changes in rail operations would occur, no safety impacts are expected to result from the No-Action Alternative.

The annual accident frequency rate for the existing conditions on the Bayport Loop and Industrial Lead ranges from 0.018 to 0.074 for all highway/rail at-grade crossings. This translates into a range of one accident every 56 to 14 years.

4.5 NOISE AND VIBRATION

4.5.1 Methodology

4.5.1.1 Wayside Noise Model

SEA used noise measurements of BNSF trains to provide a basis for the noise level projections. Wayside noise level projections (away from grade crossings where horns are not sounded) were based on data from SEA (1995). Noise from freight cars is caused by the steel wheels rolling on the steel rails. This is referred to as wheel/rail noise. Wheel/rail noise varies as a function of speed and can increase by as much as 15 dBA when wheels or rail are in poor condition. One of the most common problems that creates additional noise on wheels is the formation of flat surfaces on wheels caused by wheels sliding under hard braking.

The main components of locomotive noise are the exhaust of the diesel engines, cooling fans, general engine noise, and the wheel/rail interaction. Noise associated with the engine exhaust and cooling fans usually dominates; this noise is dependent on the throttle setting (most locomotives have eight throttle settings) and not on locomotive speed.

Tests have shown locomotive noise to change by about 2 dBA for each step change in throttle setting. This means that noise levels increase by about 16 dBA as the locomotive throttle is moved from notch one to notch eight. Because locomotive engineers constantly adjust throttle setting as necessary, only rough estimates of throttle settings are usually available for noise projections. Numerous field measurements of freight train operations indicate that assuming a

base condition of throttle position six and adjusting noise levels when better information about typical throttle position is known results in reasonably accurate projections of locomotive noise.

Given the L_{max}, or maximum train passby sound level, of freight cars and a locomotive under a specific set of reference conditions, the noise models allow estimating L_{max}, Sound Exposure Level (SEL), L_{dn} and other noise metrics for varying distance from the track, train speeds, and schedules. The standard approach to projecting freight car noise is to model freight cars as moving, incoherent (i.e., random), dipole line sources, wherein the cars are sources of sound moving in a straight line with no fixed pattern to the generation of the sound, which is equal in both directions from the track center line. The basic equations used for the wayside noise model projections are found in Appendix G.

4.5.1.2 Horn Noise Model

The individual operating rules of each railroad require train engineers to sound horns when approaching most grade crossings. Horn sounding is generally not required at private crossings. FRA Regulation 229.129 requires all lead locomotives to have an audible warning device that produces a minimum sound level of 96 dBA at a distance 100 feet in front of the locomotive. Most freight train audible warning devices are air horns. The maximum sound level of the air horns usually can be adjusted to some degree by adjusting the air pressure. Maximum sound levels are typically 105 to 110 dBA at 100 feet in front of the trains, well above the 96 dBA value required by the FRA. The exact manner in which the horns are sounded varies depending on local and state ordinances.

Because of the high noise levels created by train horns, noise exposure will be dominated by horn noise near any grade crossing where sounding horns is required. Additional noise sources associated with grade crossings are the grade crossing bells that start sounding just before the gates are lowered and idling traffic that must wait at the crossing. This noise is usually insignificant in comparison to the horn noise.

The key components in projecting noise exposure from horn noise are the horn sound level, the duration of the horn noise, the distance of the receptor from the tracks, and the number of trains during daytime and nighttime hours.

4.5.1.3 Construction Noise

Construction noise is temporary and therefore no standardized criteria have been developed to assess its impacts. The City of Houston Code of Ordinances specifically exempts construction activity from its residential noise regulation and instead limits maximum sound levels to 85 dBA at residential property line locations. To aid the project planning process, FTA has developed construction noise guidelines (FTA, 1995) which allow for more detailed analysis. SEA used these guidelines and FTA's suggested approach for estimating construction noise to analyze the potential impacts of construction noise. FTA suggests using the two noisiest pieces of equipment to estimate noise levels at sensitive locations. Based on construction equipment information provided by the Applicants, SEA used heavy trucks and bulldozers as the two noisiest pieces of equipment that would be used along most of the new rail line. SEA also estimated noise levels

from pile driving activities associated with bridge construction at specific locations. Because FTA's recommended construction noise guidelines are lower for residences than for commercial or industrial locations, SEA evaluated construction noise levels at the residential locations closest to each of the Build Segments.

4.5.1.4 Vibration

SEA evaluated the potential impacts from vibration by using information from the literature on train-induced vibration levels as a function of distance from a rail line and vibration levels likely to result in building damage or annoyance in combination with information on the location of residences or other buildings in relation to the proposed new rail line. Because vibration impacts are evaluated on the basis of maximum levels, vibration levels on existing rail lines would be essentially unchanged by additional rail traffic, so SEA did not analyze potential impacts from vibration on existing rail lines that would be used as part of the Proposed Action and Alternatives.

SEA evaluated potential impacts from vibration during construction by using information from the literature on vibration from construction equipment and FTA vibration damage thresholds.

4.5.2 Impact Analysis

4.5.2.1 Wayside Noise

The "standard train" for the Build Segments analysis consists of two locomotives and 66 rail cars. Train length data used for other rail segments are shown in Appendix C. Table 4.5-1 shows distances to the wayside 65 L_{dn} noise contour for different numbers of trains per day for project Alternatives. In calculating estimated noise contour distances, SEA assumed that trains are equally likely to occur any hour of a 24-hour day, which means that on average 38 percent (9 hours out of 24) of the trains would pass during the nighttime hours. This is an important assumption because, in the calculation of L_{dn}, one nighttime train is equivalent of ten daytime trains. Assuming that there would be no trains in the nighttime hours reduces the projected L_{dn} levels by over 6 decibels.

4.5.2.2 Horn Noise

Freight train horn noise levels can vary due to a variety of factors, including the manner in which a particular engineer sounds the horn. Consequently, it is important to base horn noise reference levels upon a large sample size. A substantial amount of horn noise data are available from FRA (1999). These FRA data indicate that horn noise levels increase from the point at which the horn is sounded 1/4 mile from the grade crossing to when it stops sounding at the grade crossing. In the first 1/8 mile segment, the energy average SEL (measured at a distance of 100 feet from the tracks) was found to be 107 dBA and 110 dBA in the second 1/8 mile segment. FRA (1999) simplified the horn noise contour to be a five-sided polygon that abruptly ends at the initial 1/4 mile sounding position as shown in Figure 4.5-1. That portion of the contour actually extends beyond the 1/4 mile position (away from the crossing) and tapers into the wayside noise contour as shown in Figure 4.5-2. This example shows some shielding due to two buildings. Extensive

Table 4.5-1
Summary of Distances to 65 L_{dn} Noise Levels

Segment Used by Alternative	Existing Trains	Distance (feet)* to Existing 65 L_{dn} Contour		Future Trains	Distance (feet)* to Future 65 L_{dn} Contour		Noise Level Increase (dBA)	Speed (mph)
		Wayside	Horn		Wayside	Horn		
Proposed Action and Alternative 1C								
Build Segment	0	N/A	N/A	2	20	N/A	N/A	20
Former GH&H[I] (MP 2.1-9.6)	3.4	40	310	5.4	60	420	2.0	20
Former GH&H[II] (MP 9.6-15.9)	3.4	50	310	5.4	70	420	2.0	35
Tower 30 to Tower 85	5	50	400	7	70	500	1.5	20
Tower 85 to Tower 87	25.1	210	1,170	27.1	220	1,230	0.3	20
Tower 87 to Dawes (MP 356.2-356.8)	20.7	190	1,030	22.7	200	1,090	0.4	25
Tower 87 to Dawes (MP 353.0-356.2)	20.7	300	1,030	22.7	320	1,090	0.4	50
Dawes to Dayton Jct (MP 353.0-352.7)	20.7	300	1,030	22.7	320	1,090	0.4	50
Dawes to Dayton Jct (MP 352.7-345.0)	20.7	370	1,030	22.7	390	1,090	0.4	60
Dawes to Dayton Jct (MP 345.0-344.2)	20.7	250	1,030	22.7	260	1,090	0.4	40
Dawes to Dayton Jct (MP 344.2-343.5)	20.7	200	1,030	22.7	220	1,090	0.4	30
Dawes to Dayton Jct (MP 343.5-342.2)	20.7	250	1,030	22.7	260	1,090	0.4	40
Dawes to Dayton Jct (MP 342.2-327.7)	20.7	370	1,030	22.7	390	1,090	0.4	60
Dayton Jct to CMC Dayton Yard	14.9	200	820	16.9	220	900	0.5	10
Alternatives 2B or 2D								
Build Segment	0	N/A	N/A	2	20	N/A	N/A	20
Former GH&H[I] (MP 2.1-9.6)	3.4	40	310	5.4	60	420	2.0	20
Former GH&H[II] (MP 9.6-13.4)	3.4	50	310	5.4	70	420	2.0	35
Tower 30 to Tower 85	5	50	400	7	70	500	1.5	20
Tower 85 to Tower 87	25.1	210	1,170	27.1	220	1,230	0.3	20

Table 4.5-1 (continued)
Summary of Distances to 65 L_{dn} Noise Levels

Segment Used by Alternative	Existing Trains	Distance (feet)* to Existing 65 L_{dn} Contour		Future Trains	Distance (feet)* to Future 65 L_{dn} Contour		Noise Level Increase (dBA)	Speed (mph)
		Wayside	Horn		Wayside	Horn		
Tower 87 to Dawes (MP 356.2-356.8)	20.7	190	1,030	22.7	200	1,090	0.4	25
Tower 87 to Dawes (MP 353.0-356.2)	20.7	300	1,030	22.7	320	1,090	0.4	50
Dawes to Dayton Jct (MP 353.0-352.7)	20.7	300	1,030	22.7	320	1,090	0.4	50
Dawes to Dayton Jct (MP 352.7-345.0)	20.7	370	1,030	22.7	390	1,090	0.4	60
Dawes to Dayton Jct (MP 345.0-344.2)	20.7	250	1,030	22.7	260	1,090	0.4	40
Dawes to Dayton Jct (MP 344.2-343.5)	20.7	200	1,030	22.7	220	1,090	0.4	30
Dawes to Dayton Jct (MP 343.5-342.2)	20.7	250	1,030	22.7	260	1,090	0.4	40
Dawes to Dayton Jct (MP 342.2-327.7)	20.7	370	1,030	22.7	390	1,090	0.4	60
Dayton Jct to CMC Dayton Yard	14.9	200	820	16.9	220	900	0.5	10
No-Build Alternative								
Bayport Loop	10.5	150	650	12.5	170	730	0.8	10
Bayport Industrial Lead	7.4	110	520	9.4	140	610	1.0	10
Strang Yard to Pasadena Jct	12.1	110	720	14.1	120	790	0.7	20
Pasadena J to Sinco J	20.1	170	1010	22.1	180	1070	0.4	20
Sinco J to Tower 30	13.1	120	760	15.1	130	830	0.6	20
Tower 30 to Tower 85	5	50	400	7	70	500	1.5	20
Tower 85 to Tower 87	25.1	210	1170	27.1	220	1230	0.3	20
Tower 87 to Dawes (MP 356.2-356.8)	20.7	190	1030	22.7	200	1090	0.4	25
Tower 87 to Dawes (MP 353.0-356.2)	20.7	300	1030	22.7	320	1090	0.4	50
Dawes to Dayton Jct (MP 353.0-352.7)	20.7	300	1030	22.7	320	1090	0.4	50

Table 4.5-1 (continued)
Summary of Distances to 65 L_{dn} Noise Levels

Segment Used by Alternative	Existing Trains	Distance (feet)* to Existing 65 L_{dn} Contour		Future Trains	Distance (feet)* to Future 65 L_{dn} Contour		Noise Level Increase (dBA)	Speed (mph)
		Wayside	Horn		Wayside	Horn		
Dawes to Dayton Jct (MP 352.7-345.0)	20.7	370	1030	22.7	390	1090	0.4	60
Dawes to Dayton Jct (MP 345.0-344.2)	20.7	250	1030	22.7	260	1090	0.4	40
Dawes to Dayton Jct (MP 344.2-343.5)	20.7	200	1030	22.7	220	1090	0.4	30
Dawes to Dayton Jct (MP 343.5-342.2)	20.7	250	1030	22.7	260	1090	0.4	40
Dawes to Dayton Jct (MP 342.2-327.7)	20.7	370	1030	22.7	390	1090	0.4	60
Dayton Jct to CMC Dayton Yard	14.9	200	820	16.9	220	900	0.5	10

* Rounded to the nearest 10 feet.

Figure 4.5-1
FRA Horn Noise Contour

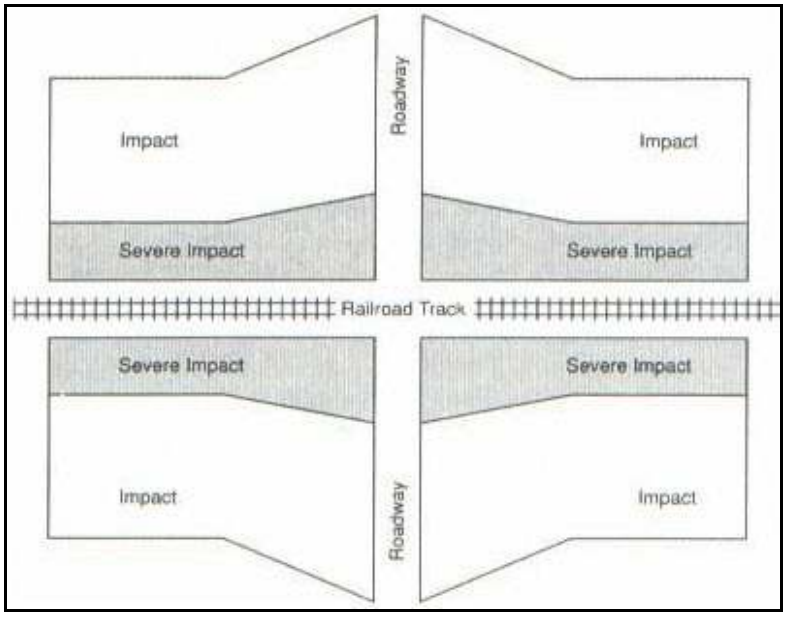
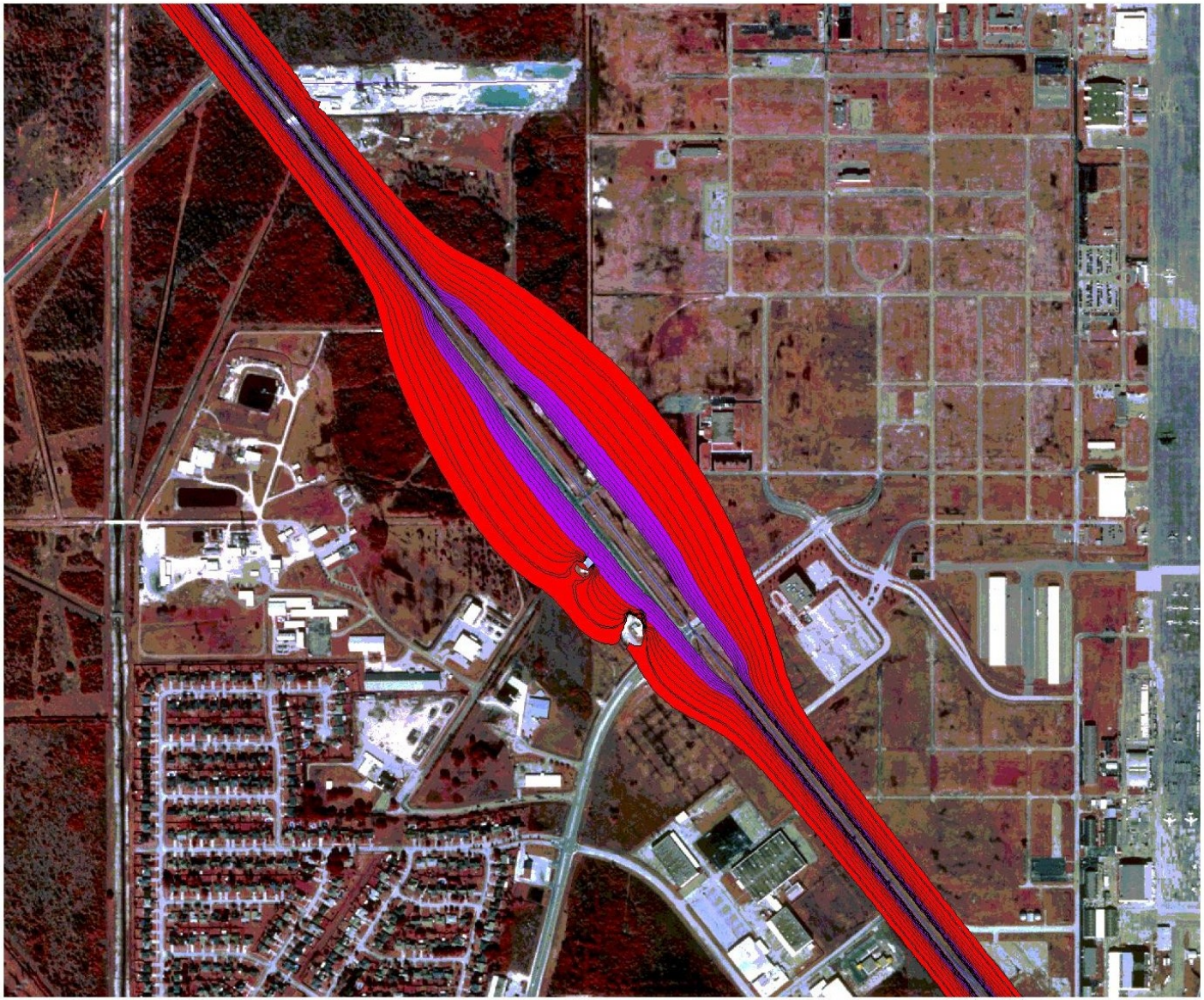


Figure 4.5-2
Example "Teardrop" Horn Noise Contour



horn noise measurements conducted in Cleveland, Ohio confirm this "teardrop" horn noise contour shape (Acentech, 2001). The attenuation or drop-off rate of horn noise is assumed to be 4.5 dBA per doubling of distance away from the tracks.

Table 4.5-1 shows the distance to the 65 L_{dn} horn noise contour for the different numbers of trains per day for project Alternatives. These contours assume that trains are equally likely to occur any hour of the day. Table 4.5-1 includes no adjustments for building or terrain shielding. SEA included building shielding adjustments as a final step in the noise contour map generation.

Building Shielding. An important factor in Table 4.5-1 is that no excess attenuation from acoustic shielding is included. At distances beyond approximately 100 feet, there are often obstructions such as buildings or terrain that act as a partial acoustic shield causing attenuation of approximately 5 to 10 dBA. As one of the final steps in the noise modeling process, SEA included adjustments for building shielding, based on International Standards Organization (ISO) 9613-2. SEA did not make any adjustments for shielding due to terrain.

Train Frequency Spectra. In order to properly calculate building shielding effects, both wayside and horn noise were characterized by representative frequency spectra. Low-frequency sound can diffract, or bend, more easily than high-frequency sound over or around buildings; therefore, it is important to model horn and wayside noise separately according to frequency content. Figures 4.5-3 and 4.5-4 show these horn and wayside noise spectra.

Figure 4.5-3
Horn Noise Spectrum

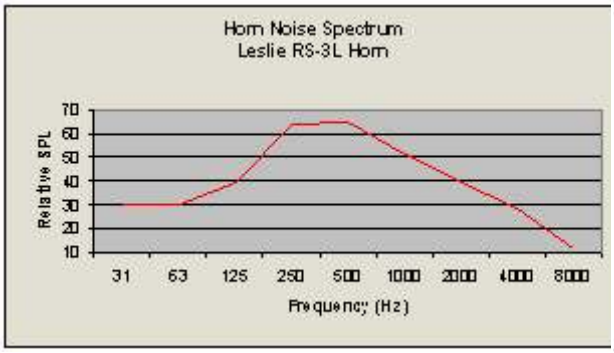
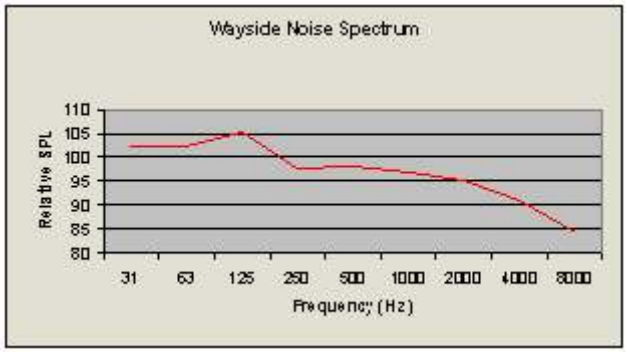


Figure 4.5-4
Wayside Noise Spectrum



4.5.2.3 Rail Operations Noise Summary

Table 4.5-1 shows approximate distances to the wayside (train noise without horns) and horn noise contours from track centerline for the Proposed Action and Alternatives. These distances do not include the effects of building shielding. However, building shielding effects were accounted for in the noise contours in Appendix G. Also shown are increases in noise due to the additional project-related two trains per day. For the Build Alternatives, all increases in noise level would be less than or equal to 2 dBA. This is not a substantial increase in railroad noise level. Based on current noise annoyance research, an increase in railroad noise of less than 3 dBA L_{dn} from a baseline of 65 L_{dn} is not considered adverse (Coate, Cowan, Maxon, 1999).

The increase in noise level for the Build Segments is undefined because there is no pre-existing rail traffic. However, ambient noise measurements indicate that noise levels are already at or greater than 65 dBA L_{dn} and therefore an increase in noise level of less than 3 dBA would be expected.

SEA estimated that the number of noise-sensitive receptors that would be exposed to a noise level of 65 dBA L_{dn} would increase from approximately 1,319 under existing conditions to approximately 1,548 for any of the Build Alternatives. The increase of 229 receptors would be the same for all Build Alternatives because no noise-sensitive receptors would be located within the 65 dBA L_{dn} contour along any of the Build Segments. The majority of these 229 receptors are in locations where the increase in noise level would be less than 0.5 dBA. (See Appendix G for additional details.)

The No-Build Alternative would have increases in noise level less than or equal to 1.5 dBA. SEA estimated that the number of noise-sensitive receptors that would be exposed to a noise level of 65 dBA L_{dn} would increase from approximately 1,392 under existing conditions to approximately 1,580 for the No-Build Alternative. A majority of the 188 additional receptors are in locations where the increase in noise level would be less than 0.5 dBA.

4.5.2.4 Rail Construction Noise Impacts

SEA estimated construction noise levels for each of the Alternatives that include new rail construction and found that the estimated mobile source construction noise levels do not exceed FTA guidelines for either 8-hour or 30-day noise levels at any residential locations.[5] (See Appendix G for additional details.)

SEA also evaluated pile driving noise that may result from construction of bridges at Red Bluff Road and Space Center Boulevard, Taylor Bayou, Armand Bayou, Horsepen Bayou, Spring Gully, Big Island Slough, and Harris County Flood Control District ditches. The minimum distance to residential locations for any of these bridge locations would be approximately 1,700 feet. Assuming continuous pile driving for 8 hours per day and continuous use for 30 days (or longer at some locations), the 8-hour L_{eq} and 30 day L_{dn} would be approximately 70 dBA at a distance of 1,700 feet. This value is below the construction noise guidelines shown in Table G.2-1.

4.5.2.5 Vibration

Unlike noise, vibration impacts are evaluated on the basis of maximum level. Because train speeds over the Build Segments are projected to be low (20 mph maximum) vibration levels due to rail operations also would be low. For example, a freight train traveling at 50 mph will generate a vibration level of 95 VdB (re: 1 micro in./sec) measured 10 feet from the tracks

[5] SEA also estimated noise levels at NASA's Sonny Carter Training Facility, which is located approximately 950 feet from the Proposed Action and Alternative 1C. At this location, the 8-hour L_{eq} would be 62 dBA and the 30-day L_{dn} would be 56 dBA, well below the FTA construction noise guidelines.

(FTA, 1995). This level of vibration is substantially lower than cosmetic building damage levels (0.20 in./sec - nominally 106 VdB, or 100 VdB assuming a crest factor of 2) (Martin, 1980) and structural damage levels (126 VdB) (Nichols, et al., 1971). Because vibration level decreases as train speed decreases, vibration levels associated with the proposed new rail line would be even lower than these values. Consequently, no building damage related to vibration due to train operations is expected.

According to the Federal Transit Administration (FTA), a vibration level of 80 VdB or above constitutes an impact in terms of human annoyance for infrequent train events (fewer than 70 events per day). For a freight train traveling 20 mph, this annoyance impact corridor extends approximately 30 feet from the tracks (FTA, 1995). No residential buildings are located within 30 feet of the proposed new rail line; therefore, no vibration impacts related to annoyance are expected.

For areas where rail traffic currently exists, vibrations resulting from additional rail traffic would not constitute an impact because maximum vibration levels would be essentially unchanged.

Table 4.5-2 shows estimated construction vibration levels at representative distances to residential locations adjacent to each Build Alternative. These vibration levels, expressed in terms of Peak Particle Velocity (PPV) are based on representative bulldozer vibration levels. These values are less than FTA vibration damage threshold criterion of 0.20 in./sec for fragile buildings, and 0.12 in./sec for extremely fragile historic buildings.

Table 4.5-2
Estimated Construction Vibration Levels

Alternative	Approximate Distance to Closest Receptor (ft.)	Bulldozer PPV (in./sec)
Proposed Action	1,770	0.0002
Alternative 1C	540	0.0009
Alternative 2B	140	0.0071
Alternative 2D	380	0.0015

SEA also estimated vibration levels due to pile driving. At a distance of 1,700 feet, pile-driving vibration levels would be approximately 0.0027 in./sec, well below damage thresholds.

Thus, SEA has concluded that no vibration impacts would result from the Proposed Action or any of the Alternatives studied.

In addition, SEA and NASA have considered site-specific noise and vibration impacts to the NASA Neutral Buoyancy Lab (NBL), because of the unique training and research aspects of this facility. The Proposed Action and Alternative 1C would be approximately 950 feet from the NBL. NASA wanted to know whether audible underwater sound in the NBL caused by train-induced ground-borne vibration would be loud enough to interfere with radio communication for

training astronauts. SEA's analysis has shown that there would be no noise and vibration impacts to human health and safety or structural damage. However, because of the unique training and research aspects of this facility, the Applicants responded to NASA's concerns by estimating ground-borne noise levels in the tank. SEA independently reviewed this analysis and agrees with the findings.

The Applicants used published vibration data from the Federal Transit Administration and typical freight train vibration spectra to eliminate a noise level of approximately 50 dBA at the astronaut's ear. Since typical conversation at the listener's ear is 55 to 60 dBA, the train noise would be 5 to 10 decibels lower than the radio communication, which is sufficient signal-to-noise ratio for clear communication. In addition, the Applicants did not take into account the "coupling loss" associated with the tank structure. In general, massive concrete structures, such as this tank structure, can be difficult to set into motion by train vibration. In addition, there is a large airspace between the tank walls and the building foundation, which will provide substantial vibration/noise attenuation. Consequently, actual noise levels in the tank would likely be lower than the Applicants' estimate. The train noise would be at a lower frequency than human speech, which would result in even lower perceived noise levels (i.e., a lower potential for masking effects).

In summary, SEA has determined that there would be no human health and safety impacts or structural damage impacts at NBL due to train vibration/noise associated with the Proposed Action and Alternative 1C. Train-induced ground-borne noise may be audible in the NBL tank, but would likely not interfere at all with radio communications. SEA is working with NASA to conduct site-specific vibration testing to confirm these noise level estimates and assumptions.

4.6 CLIMATE AND AIR QUALITY

4.6.1 Methodology

SEA examined the potential impacts to existing climate conditions in the HGA, including consideration of ozone climatology.

SEA evaluated the potential air quality impacts of the Proposed Action and Alternatives in three steps. First, SEA identified and characterized the emission sources that would result from the project. Second, SEA aggregated emissions from all of these sources into a consolidated emission inventory. Third, SEA compared the increase in emissions with three criteria to evaluate the potential impacts. The methodology is presented in detail in Appendix H.

SEA analyzed emissions from idling vehicles delayed at highway/rail at-grade crossings. SEA's approach used the daily vehicle delay time information discussed in Section 4.4.2 in combination with number of days per year, average daily traffic volume, and the fleet average emission factor to determine the annual total emissions as a result of delay. Additional detail is provided in Appendix H.

4.6.2 Impact Analysis

4.6.2.1 Build and No-Build Alternatives

Climate. Under the Build and No-Build Alternatives, no changes in existing climate conditions would occur.

Rail Operations and Construction. Table 4.6-1 summarizes the estimated emissions associated with construction and operation of the Build Alternatives that SEA developed and used in this analysis. Additional detail is provided in Appendix H.

Table 4.6-1
Estimated Maximum* Emissions from Construction and Operation

	Construction Phase		Operational
	Averaged Daily Off-Road and Rail (kg/day)	Averaged Daily On-Road (kg/day)	Switching and Line Haul Operations (kg/day)
Diesel PM	2.1	0.62	0.62
NO_x	35.1	16.0	25.0

*Based on the Build Alternatives that would result in the largest estimated increase in emissions.

SEA developed an emissions inventory for each Build Alternative. Because the length of new rail construction is similar for all of the Build Alternatives, however, the estimated emissions are similar as well. To be conservative, SEA used estimated emissions for construction for the Alternative requiring the most new rail construction (Alternative 2B) in this analysis. Because nearly all of the emission sources associated with the Proposed Action and Alternatives would be associated with the combustion of diesel fuel, which emits very small amounts of VOCs relative to NO_x, SEA developed quantified estimates only of emissions of NO_x and diesel PM.

Similarly, emissions from operation are also estimated to be similar for all of the Build Alternatives, both because the lengths of the alignments are similar and because estimated emissions from operation are dominated by emissions from switching activities, which are assumed to be identical for all of the Build Alternatives. To be conservative, SEA used estimated emissions for operation based on the Build Alternative with the longest overall length (Alternative 1C) in this analysis.

The current State Implementation Plan (SIP) emission inventory for Harris County estimates that total railroad emissions of NO_x average 9,800 kg/day. Thus, estimated emissions from the Build Alternatives would represent an increase of less than 0.5 percent (51.1/9,800) during construction and a 0.26 percent increase (25.0/9,800) during operation.

In the context of the "Statement of Principles Houston/Galveston Ozone Non-attainment Area Railroad Program," the estimated increase in NO_x emissions would marginally decrease the planned reduction from approximately 2,000 kg/day to 1,949 kg/day during the construction

phase and by approximately 1 percent during operation. Thus, SEA concluded that the estimated increase in NO_x emissions from the Build Alternatives would be minimal relative to the Houston-Galveston ozone SIP.

A conformity determination is required in the Houston area when NO_x emissions from a proposed project would be greater than a threshold amount of 25 tons per year. The maximum estimated NO_x 12-month total emission increase is 20.5 tons/year during construction. Because estimated emissions are less than 25 tons per year, the Build Alternatives would not be subject to conformity requirements.

Based on December 2001 average daily traffic data for Harris County, and assuming the national default average of 5 percent heavy heavy-duty diesel trucks, SEA estimates that the current average daily emission rate for diesel PM from diesel truck activity is 3,435 kg/day. Thus, the increase in estimated countywide diesel PM emissions from the Build Alternatives would be less than a 0.1 percent (2.7/3,435) during construction and less than 0.02 percent during the operation.

For perspective on the estimated diesel PM emissions at a local scale, SEA estimated emissions for three roadway intersections within a quarter mile (1,320 feet) of the Proposed Action for both approaching and departing traffic. In addition, SEA also estimated diesel PM emissions for current activity along a half mile stretch along the GH&H line from Graham Siding to Tower 30 and from Tower 30 to Tower 85. For the stretch between Graham Siding and Tower 30, SEA estimated the daily average emission rate based on the current rail activity of 3.4 train trips per day moving an average of 53.5 cars per day using two locomotives per trip. For the stretch between Tower 30 and Tower 85, SEA estimated the daily average emission rate based on the current rail activity of 5 train trips per day moving an average of 56.5 cars per day using two locomotives per trip. Table 4.6-2 shows the daily average emission rate at three roadway locations and along the GH&H line.

SEA has estimated that diesel PM emissions during construction of the Build Alternatives would average approximately 2,700 g/day, which is about two to three times greater than estimated emissions at a heavily trafficked roadway intersection. However, emissions from construction of the Build Alternatives would not be concentrated at a single location but instead would be distributed over the project area as portions of the new rail line are completed and construction begins on other portions of the line. Thus, on an annual basis, SEA has estimated that diesel PM emissions from construction at any location along the Build Alternatives would be significantly less than those near a heavily trafficked roadway intersection.

During the operational phase, SEA has estimated that the total average daily diesel PM emissions over the entire route (including existing rail lines) would be about 40 to 60 percent of the estimated diesel PM emissions from traffic at a single intersection. Similarly, SEA has estimated that emissions per mile from operation of the Build and No-Build Alternatives would be less than 10 percent of the estimated emissions per mile from current activity on the GH&H line. As a result, SEA has concluded that the estimated increase in diesel PM emissions from construction and operation of the Build and No-Build Alternatives would be insignificant in the context of existing conditions.

Table 4.6-2
Average Daily Diesel PM Emission at Three Roadway Intersections and Along the GH&H Line in the Vicinity of the Build Alternatives

	Average Daily HHDDT - Main Street (Number of HHDDT)*	Average Daily HHDDT - Cross Street (Number of HHDDT)*	Average Daily Emissions (g/day)
State Highway 3 and Clear Lake City Blvd (State Hwy 2351)	1,461	1,056	1,007
East Beltway 8 and Genoa-Red Bluff Road	2,071	1,003	1,230
State Hwy 146 and W Fairmont Pkwy	2,514	1,273	1,515
GH&H Line - Graham Siding to Tower 30	N/A	N/A	66
GH&H Line - Tower 30 to Tower 85	N/A	N/A	101

*HHDDT: Heavy heavy-duty diesel trucks

Grade Crossings. Table 4.6-3 summarizes the estimated increase in emissions associated with idling vehicles delayed at grade crossings summed for all crossings for the Build and No-Build Alternatives. Additional detail is provided in Appendix H.

Table 4.6-3
Estimated Increase in Emissions from Idling Vehicles Delayed at Grade Crossings
(tons/year)

	VOCs	NO_x	PM	CO
Build Alternatives	0.79	0.30	0.007	4.0
No-Build Alternative	0.46	0.18	0.004	2.4

Table 4.6-4 shows the total emissions for Harris County (except for PM and CO, which are not available) and the estimated percentage change that would result from vehicle delay. As shown, estimated emissions are low both in absolute and relative terms. As a result, SEA concluded that the estimated increase in emissions from idling vehicles delayed at grade crossings of the Build and No-Build Alternatives would be insignificant in the context of existing conditions.

4.6.2.2 No-Action Alternative

Under the No-Action Alternative, no effects on the existing climate, no increases in air emissions, and no changes in delay would occur.

Table 4.6-4
Comparison of Harris County Total Emissions with Bayport Loop Emissions Due to Delay from the Proposed Action and No-Build Alternative

	County Total (tons/year)	PROPOSED ACTION		NO-BUILD ALTERNATIVE	
		(tons/year)	(% of total)	(tons/year)	(% of total)
VOCs	180,000	0.79	0.00044	0.46	0.00026
NO_x	219,000	0.30	0.00014	0.18	0.00008
PM	1,000*	0.007	0.00070	0.004	0.00042
CO	54,700*	4.0	0.0073	2.4	0.0044

*For a single major point source only

4.7 WATER RESOURCES

4.7.1 Methodology

SEA evaluated the effects of the Proposed Action and Alternatives on water resources, including potential effects on the groundwater aquifers, floodplains, surface waters, and wetlands characterized in Section 3.7. SEA used GIS to determine the acreage of floodplains and wetlands that would be located within the right-of-way of the Build Alternatives. The acreage calculation used the Applicants' proposed variable width of right-of-way (40-150 feet) throughout the project corridor. The areas of wider right-of-way would occur for grade separated crossings at Space Center Boulevard and Red Bluff Road, for staging areas and laydown areas, and at the crossing of Armand Bayou. Wider right-of-way would also be needed for borrow areas, which would provide fill for the rail and road beds. However, the exact location and size of the borrow areas that would be needed was not known. The Applicants have stated that the borrow areas probably would be located adjacent to the right-of-way. Appendix I includes a more detailed discussion of the methodology used in the analyses.

4.7.2 Impact Analysis – Groundwater

SEA evaluated the impacts of the Proposed Action and Alternatives on groundwater resources. The evaluation included the construction effects and the operational and maintenance related effects. SEA concluded that the Proposed Action and Alternatives would not affect a designated Sole Source Aquifer or a designated groundwater recharge area.

4.7.2.1 Build Alternatives

Construction Impacts. SEA evaluated the potential for hydrological impacts resulting from excavation and filling, and water quality impacts resulting from spills of fuels, solvents, or other hazardous materials used during construction. SEA determined that construction of the Build Alternatives would result in only minor effects on groundwater hydrology and quality.

The Build Alternatives would involve ground disturbance above the Chicot and Evangeline Aquifers, which are part of the Gulf Coastal Aquifer system. The Chicot Aquifer is a source of domestic and industrial water and is included in Houston's Wellhead Protection area. The water table in the Gulf Coastal Aquifer system ranges from about 10 to 30 feet below the land surface. Excavation below the water table could expose the upper part of the Chicot Aquifer. However, SEA does not expect excavation and grading for the construction of the Build Alternatives to reach the water table depth for most of the area of disturbance. In some areas, the proposed drainage channels may intercept the upper part of the water table aquifer. Any excavation that intercepted the water table would not be of sufficient depth and area to affect the water table significantly. At stream crossings, excavation may intercept a groundwater seep and increase the potential for groundwater discharge. However, the increase in groundwater discharge into surface waters would be small, and only minor hydrological impacts would be expected.

The Evangeline Aquifer is located approximately 500 to 2,200 feet below mean sea level (msl) and is a confined aquifer that is not hydraulically connected to the Chicot Aquifer. Because of its depth below the surface and its confined nature, it would not be affected by construction-related activities.

Spills of fuel, solvents, or other hazardous materials used to operate or maintain construction equipment could contaminate groundwater. However, only small quantities of hazardous materials would be stored or used during construction and the likelihood of construction-related spills would be small. In addition, the Applicants would handle hazardous materials in accordance with applicable regulatory requirements, which would minimize the risk of spills.

Operation and Maintenance Impacts. Operation and maintenance of the proposed rail line would not require groundwater withdrawals. The Build Alternatives would have no effect on water supply wells in the project area. The potential water quality effects associated with a hazardous materials spill during rail line operations are evaluated in Section 4.2. The Build Alternatives may cause a slight increase in groundwater discharge to drainage ditches and surface water bodies if the excavation intercepts the water table. SEA identified no other potential operation-related effects on groundwater.

The Build Alternatives include use of existing rail lines. Although rail traffic would increase slightly on these existing lines, groundwater resources in this area would not be directly affected. The additional train traffic that would be generated would create a very slight increase in the potential for a hazardous materials release to groundwater along these lines.

4.7.2.2 No-Build Alternative

BNSF's use of the existing UP lines to access the Bayport Loop would involve no new construction. This Alternative would not directly affect groundwater resources, but would cause a very slight increase in the potential for a hazardous materials release, which would be very unlikely to affect groundwater. The existing train traffic on the Bayport Loop Industrial Lead, Strang Subdivision, GH&H line (from Tower 30 to Tower 85), and East Belt, Terminal, Lafayette, and Baytown Subdivisions includes hazardous materials shipments. Under the No-Build Alternative, all of those lines would have an increase in hazardous materials volumes but

hazardous materials volumes would remain the same on the Strang Subdivision. SEA concluded that the No-Build Alternative would have no affect on groundwater.

4.7.2.3 No-Action Alternative

The No-Action Alternative would not affect groundwater resources because there would be no new construction or other activities affecting groundwater. The existing train traffic on the UP line includes hazardous materials shipments. The No-Action Alternative would not change the existing potential for groundwater contamination resulting from a hazardous materials spill on the UP line.

4.7.3 Impact Analysis – Floodplains

SEA evaluated the impacts from the Proposed Action and Alternatives that involve construction, operation and maintenance activities in the 100-year and 500-year floodplains. SEA also analyzed the regulatory approvals and design and construction requirements that would be needed because of floodplain impacts. The impact evaluation is based on preliminary designs for the rail line provided by the Applicants. The impact footprint may be revised slightly as the design progresses, but these design refinements are not expected to materially change the expected impacts.

4.7.3.1 Build Alternatives

The Build Alternatives would be located in a predominantly flat coastal plain that has numerous floodplains associated with the waterways and several man-made drainage channels. The project area is located in a portion of the Texas Coastal Plain that is prone to flooding. However, the incidence and severity of flooding in the area has been reduced by a number of drainage improvement projects undertaken by the HCFCD since 1937. These projects include channelization of Horsepen Bayou, Spring Gully, and Big Island Slough, the creation of artificial drainage channels, and the creation of a regional stormwater detention basin and new drainage channel adjacent to Ellington Field.

SEA determined the extent of 100-year and 500-year floodplains in the project area from the FEMA 1996 Flood Insurance Rate map.[6] These floodplains are shown in Figure 3.7-1. The Proposed Action would intersect floodplains drained by Horsepen Bayou, Armand Bayou, Spring Gully, Big Island Slough, and Taylor Bayou. The area of rights-of-way within 100-year and 500-year floodplains are compared in Table 4.7-1. The right-of-way for the Proposed Action within 100-year floodplains would be approximately 32 acres. The area of the Proposed Action within 500-year floodplains would be approximately 49.48 acres. The Proposed Action would

[6] SEA used 1996 Flood Insurance Rate Map (FIRM) data. Certain FIRM Panels have been revised since that time, becoming effective on April 20, 2000. The 2000 revisions include minor floodplain boundary changes within one FIRM Panel for the project area (Panel 48201C1060 K). The 1996 data were used because the GIS data for the 2000 revisions were unavailable when this document went to print. However, the use of 2000 data would not significantly affect the analysis of floodplain impacts because the boundary revisions were minor and applied to a small section of the project area.

Table 4.7-1
Area of Rights-of-Way Within 100-Year and 500-Year Floodplains by Alternative

Floodplain Impact	Alternatives				
	Proposed Action	**1C**	**2B**	**2D**	**Original Taylor Bayou Crossing**
Area of Right-of-Way Within 100-year Floodplains (acres)	32.00	31.88	31.54	31.54	31.81
Area of Right-of-Way Within 500-year Floodplains (acres)	49.48	50.29	44.64	44.64	51.41

result in the permanent conversion of some of the floodplain within the right-of-way because fill material would be placed to raise the bed of the rail line. The floodway along Horsepen Bayou, Armand Bayou, Big Island Slough, and Spring Gully would be spanned by the proposed bridges and would not be filled.

As shown in Table 4.7-1, compared to the Proposed Action, the other Build Alternatives would affect similar acreages of 100-year floodplain. The Proposed Action would affect a similar amount of 500-year floodplain area as the other Build Alternatives. Alternatives 2B and 2D would affect the smallest amount of 500-year floodplain, about 4.9 acres less than the Proposed Action. Alternatives 2B and 2D differ from the Proposed Action and Alternative 1C because they would not intersect the floodplain of Horsepen Bayou and the manmade drainage channel south of Ellington Field. However, this difference only slightly reduces the total length and area of Alternatives 2B and 2D that are located within 100-year floodplains compared to the Proposed Action.

The segment of the Proposed Action near Ellington Field crosses an HCFCD regional stormwater detention basin and crosses a manmade drainage channel (HCFCD, 2002). In addition, the Proposed Action and Build Alternatives would parallel a manmade drainage channel inside the Bayport Loop. This channel would be crossed in several locations using turnout bridges.

SEA concluded that the Build Alternatives would not exacerbate flooding for several reasons. First, much of the floodplain would be spanned by bridges and the amount of floodplain actually filled would be relatively small compared to the amount within the region. Second, the proposed drainage channels and floodplain crossings along the rail line would be designed to manage stormwater flows. In particular, the design would include properly sized, sited, constructed, and maintained bridges and culverts, and new drainage ditches on both sides of the rail bed along most of the alignment. The proposed ditches would drain into surface waters and existing HCFCD drainage channels. The proposed drainage channels could help reduce flooding in some locations where flood control improvements have not been constructed. Third, to ensure that the project provides adequate flood control and minimizes effects on floodplains, the design and specifications for bridges, culverts, channels, and related structures would have to satisfy the HCFCD requirements. For example, all bridge crossings would accommodate flood flows from 24-hour, one-percent probability storms. In addition, the structures crossing the floodplains

would conform to all applicable design standards required by the floodplain program administered by Harris County. The design of crossings of flood control channels or connections to drainage channels would require approval from the Engineering Division and the Flood Control Division of the Harris County Public Infrastructure Department.

The Proposed Action would result in the potential disturbance of about 32 acres of 100-year floodplain. The amount of 100-year floodplain that would be permanently modified would be much less because the floodways along Horsepan Bayou, Armand Bayou, Big Island Slough, and Spring Gully would be spanned with bridges. SEA concluded that the only practicable Alternatives that could be authorized by the Board require siting in a floodplain because of the linear nature of the project and the number and amount of floodplains in the project area. Good design and compliance with the required regulatory programs would ensure that effects on floodplains would be minor. SEA has reached a preliminary finding that the Proposed Action and Build Alternatives would be in compliance with Executive Order 11988 on Floodplain Management and has addressed the notice requirements through the Notice of Availability for the Draft EIS, including an explanation of why the action is proposed to be located in a floodplain.

All Build Alternatives include the use of existing rail lines to access the Bayport Loop. Although rail traffic would increase slightly on these existing lines, the floodplains would not be affected because no new construction would occur. There would be a very slight increase in the potential for a hazardous materials incident because of the additional train traffic that would be generated.

4.7.3.2 No-Build Alternative

Floodplains and drainage in the project area would be unaffected if BNSF uses the existing UP lines to access the Bayport Loop. Floodplains would be unaffected because there would be no new construction to potentially alter drainage patterns. This Alternative would have less potential to affect floodplains than the Build Alternatives.

4.7.3.3 No-Action Alternative

Because the No-Action Alternative would not involve construction, floodplains and flood drainage would be unaffected. The existing rail traffic carried by UP includes hazardous materials shipments. The No-Action Alternative would not change the existing potential for contamination of floodplains resulting from a hazardous materials spill on the UP line.

4.7.4 Impact Analysis – Surface Water

SEA evaluated the impacts of the Proposed Action and Alternatives on surface waters. The evaluation included the construction impacts and operational and maintenance related impacts. SEA concluded that the Build Alternatives would not directly affect a designated scenic river, an impaired waterway, or a designated public water supply. However, the Build Alternatives would cross Armand Bayou, which is a state-designated Coastal Preserve and a state-designated Ecologically Significant River. A Clean Water Act Section 404 Permit from the USACE and Section 401 Water Quality Certificate from the TCEQ would be required for the placement of fill in jurisdictional waters of the U.S. The Applicants delineated wetlands and waters of the U.S.

along the alignment of each of the Build Alternatives. A jurisdictional determination of the wetlands and waters of the U.S. along the Build Alternatives has been requested from the USACE. The USACE has field verified the delineation along the Proposed Action and will be issuing a verification letter in the near future. A Section 10 permit under the River and Harbors Act would be required from the USACE for the bridge crossings of navigable waters. Stormwater discharge permits would also be needed from the TCEQ or EPA under the NPDES program and Harris County through the Stormwater Quality Permit Program. Easements would need to be secured from the Texas GLO for the crossings of state owned waterways. All of the Build Alternatives are located within the area regulated by the Texas Coastal Management Program. Therefore, the project must be reviewed for consistency with the Texas Coastal Management Program by the Texas Coastal Coordination Council, as required by the CZMA. The review will be completed as part of the USACE's Section 404 permit process. The impact evaluation is based on preliminary designs for the rail line provided by the Applicants. The impact footprint may be revised slightly as the design progresses, but these design refinements are not expected to materially change the expected impacts.

4.7.4.1 Build Alternatives

The Proposed Action would cross nine jurisdictional surface water bodies and six non-jurisdictional drainage channels (Table 4.7-2). None of these crossings would involve an impaired waterbody, a segment designated as a public water supply, or a segment designated as a scenic river. The crossing of Armand Bayou would involve a river segment designated by the state as Ecologically Significant and would cross the state-designated Armand Bayou Coastal Preserve (TNRCC, 2001 and 2002). Each of the jurisdictional perennial streams would be crossed with a bridge to minimize effects on surface waters and 100-year floodplains (TranSystems, 2001). The bridges over Horsepen Bayou, Armand Bayou, Big Island Slough, and Spring Gully would span each waterway. The bridge over Taylor Bayou would have piers/pilings in the waterway. A flooded borrow pit that is now connected to Taylor Bayou would be impacted by the Original Taylor Bayou Crossing only, by filling along the edge of the shoreline to create a rail siding area. A segment of all Build Alternatives inside the Bayport Loop would follow an unnamed HCFCD drainage channel and cross it in three locations with turnout bridges. The channel is a jurisdictional surface water where it is tidally influenced through its connection with Taylor Bayou. Two of the bridges would cross the tidal, jurisdictional portion of the channel. Both bridges would have piers/pilings in the channel.

Surface waters intersected by the Build Alternatives would receive intermittent discharge from new drainage ditches constructed adjacent to the rail line. Like existing drainage channels in the area, the new channel would typically contain water in some sections, particularly during the winter.

SEA concluded that the potential impacts of the Build Segments of Alternatives 1C, 2B, and 2D on surface waters would be similar to the potential impacts of the Proposed Action. The most important water crossings of Armand Bayou and Taylor Bayou would occur at the same location and with the same proposed structure for these Build Alternatives. All surface waters crossed by the Proposed Action would also be crossed by Alternative 1C. Alternatives 2B and 2D would cross all surface waters crossed by the Proposed Action except Horsepen Bayou and the

Table 4.7-2
Jurisdictional Surface Water Impacts for the Build Alternatives

Surface Water Name	Jurisdictional Waters of the United States*	Applicants Proposed Crossing Structure	Proposed Action, Alternatives 1C, 2B, 2D Proposed Fill Impact (acres/ft^3)**	Original Taylor Bayou Crossing (acres/ft^3)**
Horsepen Bayou	Yes	Bridge	0	0
Unnamed intermittent tributary to Armand Bayou	Yes	Culvert	0.01	0.01
Unnamed intermittent tributary to Armand Bayou	Yes	Culvert	0.02	0.02
Armand Bayou	Yes	Bridge	0	0
Spring Gully	Yes	Bridge	0	0
Big Island Slough	Yes	Bridge	0	0
HCFCD Drainage Channel at Bayport Loop	Yes (tidal portion) No (nontidal portion)	Bridges at three crossings	279 ft^3	279 ft^3
Taylor Bayou	Yes	Bridge	1,444 ft^3	1,304 ft^3
Flooded Borrow Pit connected to Taylor Bayou	Yes	Fill	0	116,300 ft^3

* Note: Jurisdictional Determination for the Proposed Action has been field verified by the USACE but not yet confirmed in writing.

** Note: Impacts were calculated based on preliminary designs and may be revised slightly as the design progresses.

unnamed, nonjurisdictional HCFCD drainage channel at the north end of Ellington Field. The Original Taylor Bayou Crossing Alternative would have a greater impact on surface waters than the other Build Alternatives. The proposed bridge over Taylor Bayou for this Alternative would have similar impacts to the bridge for the Proposed Action, but the alignment would also involve filling a portion of an abandoned borrow pit that is now filled with water, hydraulically connected to Taylor Bayou, and considered jurisdictional.

The construction of culverts and bridges would cause permanent but minor loss of stream bottom and open water habitat due to the placement of piers/pilings or placement of a culvert. The bridges for the Proposed Action would span the open water channels, except for the bridges over Taylor Bayou and the Bayport HCFCD channel, which would have piers/pilings in the channel.

The Build Alternatives would result in the filling of about 0.03 acres of two unnamed intermittent tributaries of Armand Bayou. Both of these tributaries would be crossed with culverts. The Build Alternatives (Proposed Action, Alternatives 1C, 2B, and 2D) would result in

the placement of piers/pilings in Taylor Bayou and the HCFCD Bayport drainage channel, which would impact about 1,444 ft^3 and 279 ft^3 respectively of the water column. The Original Taylor Bayou Crossing would impact more surface waters than the other Build Alternatives, including about 1,304 ft^3, 116,305 ft^3, and 279 ft^3 for Taylor Bayou, the abandoned borrow pit, and the HCFCD Bayport Drainage Channel (respectively). All of the bridges would also cause an indirect impact due to shading of the open water beneath the bridges.

The culverts and bridges would be designed and built in accordance with a Section 404 permit required by the USACE, Section 10 permit required by the USACE (for navigable waters), the requirements of the HCFCD, and the TCEQ's Section 401 Water Quality Certificate. The use of bridges, instead of culverts, for all of the proposed crossings of jurisdictional waterbodies (except the abandoned borrow pit near Taylor Bayou and two intermittent tributaries to Armand Bayou) would minimize the direct impact to waters of the U.S. and minimize the interference with stream flow and tidal ebb and flow (where present). The proposed bridge crossing of Armand Bayou would affect the riparian forest adjacent to the stream channel within the Armand Bayou Coastal Preserve. However, the crossing would span the waterway and floodway and is located adjacent to an existing pipeline and transmission line crossing of the channel. This location and design would minimize the effect on ecological resources and recreational activities. The proposed crossings of Taylor Bayou and Armand Bayou would also require easements from the Texas GLO because they would cross state-owned waterways.

Construction Impacts. The construction of bridges and culverts at stream crossings may temporarily increase total suspended solids (TSS) and other pollutant concentrations such as metals, phosphorus and nitrogen containing compounds in surface water. TSS may increase as a result of resuspension of bottom sediments by pier/piling construction, by the placement of fill, erosion of soil from disturbed slopes adjacent to surface waters, or through the connection of new drainage ditches to waterways. The Applicants have indicated that some hydraulic dredging may be necessary to construct pier footings in Taylor Bayou. If dredging is needed, then the Applicants would follow all required permit conditions and the Guidelines for Designing, Operating, and Maintaining Dredged Material Containment Areas. TSS and other pollutants have the potential to interfere with recreational water uses, impact aquatic habitat and water quality, or change hydrologic characteristics (e.g., sediment deposition patterns, in-stream scouring). However, appropriate erosion and sediment controls and in-stream construction techniques would be employed to minimize erosion and sedimentation.

BMPs for erosion control, sediment control, and post-construction TSS control would be required by the TCEQ's Section 401 Water Quality Certificate and the USACE's Section 404 permit. In-stream construction activities would be performed in accordance with the required state and Federal permits. The Texas Pollutant Discharge Elimination System (TPDES) permit from the TCEQ for construction activities or NPDES General Construction Permit from the EPA and Storm Water Quality permit from Harris County for stormwater discharges from construction activities also would require stormwater runoff controls. These BMPs are designed to ensure that stormwater discharges do not violate water quality standards established by the TCEQ (TNRCC, 2001 and City of Houston *et al.*, 2001a and City of Houston *et al.*, 2001b). SEA has determined that the Build Alternatives would be designed and constructed in a manner that is consistent with the Texas Coastal Management Program. The Applicants would have to submit an application

for a Texas Coastal Management Program consistency certification to the USACE. The USACE would then forward the application to the Coastal Coordination Council of the Texas GLO, which would publish a public notice and initiate a 45-day consistency review process. The Coastal Coordination Council would issue a determination on consistency with the Texas Coastal Management Program. This process satisfies the requirements of the Federal Coastal Zone Management Act. Based on the use of good siting, the proposed design and construction of all structures, implementation of BMPs, and compliance with all regulatory requirements, SEA expects the proposed construction activities to cause moderate impacts to surface waters.

Operation and Maintenance Impacts. Accidents (e.g., derailments) or equipment failure (e.g., leaking valves) along the rail line may result in a release of hazardous materials to surface waters. The potential for a hazardous materials release and the associated impacts are evaluated in Section 4.2. Stormwater discharges to the receiving waterbodies and existing drainage channels from the proposed drainage ditches in the rail corridor would occur, especially during storms. These stormwater discharges may contain low concentrations of pollutants such as oil and grease, TSS, metals and nitrogen and phosphorus containing compounds. However, because the proposed rail line does not include material storage areas and would have only minimal train traffic, SEA does not expect that the stormwater discharges would have high pollutant loads. The proposed bridges would cause an indirect impact due to shading of the open water beneath the bridges. Minor impacts on surface water are expected to result from the operations.

The Build Alternatives would result in a slight increase in rail traffic on existing rail lines. This increase in traffic would not adversely affect surface waters because no new construction would occur. These existing lines cross or are proximal to 19 unnamed drainage channels and unnamed tributaries, Sims Bayou, Gully Creek, Plum Creek, Brays Bayou, Buffalo Bayou, Hunting Bayou, Greens Bayou, Spring Gully, Carpenters Bayou, Sheldon Reservoir, San Jacinto River, Jackson Bayou, Cedar Bayou, Dayton Canal, and East Prong Creek. However, there would be a very slight increase in the potential for a hazardous materials incident along these lines because of the small amount of additional train traffic that would be generated.

Maintenance activities along the Build Alternatives could include excavation, stream bank stabilization, bridge repair, ditch and culvert clean out, and related disturbances at stream crossings. Maintenance of stream crossing structures could temporarily disturb or resuspend bottom sediments, or cause temporary erosion from stream banks. However, these impacts would be minor, because the area affected at each crossing would be small and maintenance activities would be infrequent and short in duration.

Maintenance of the upland portions of the right-of-way corridor may include periodic herbicide application, which could affect water quality if improperly applied. All herbicides would be used at or below the application rate recommended by the manufacturer or supplier and in accordance with state and Federal law. Therefore, the use of herbicides is expected to cause only negligible impacts on surface waters.

In summary, the impacts on surface waters from operating and maintaining the Proposed Action and other Build Alternatives would be negligible and would be sufficiently controlled through compliance with all permits and regulations and use of BMPs.

4.7.4.2 No-Build Alternative

The No-Build Alternative would have less impact on surface waters than the construction and operation of the Build Alternatives. Use of existing rail lines to access the Bayport Loop would avoid construction of new structures at surface water crossings. However, the No-Build Alternative would cause a very slight increase in the potential for a hazardous materials release to affect surface waters. The existing train traffic on the existing lines includes hazardous materials shipments, which would increase on all of the lines except the Bayport Loop Industrial Lead and Strang Subdivision, where hazardous materials volumes would remain the same. The Strang Subdivision crosses or is proximal to seven streams and six unnamed drainage ditches.

4.7.4.3 No-Action Alternative

The No-Action Alternative would avoid all direct effects on surface waters resulting from construction, operation, and maintenance of the Build or No-Build Alternatives. However, the No-Action Alternative would not change the existing potential for contamination of a waterbody from a hazardous materials spill on the UP lines currently used for Bayport Loop traffic. The existing train traffic on the UP line includes hazardous materials shipments. The existing Strang Subdivision crosses or is in close proximity to seven streams and six unnamed drainage ditches.

4.7.5 Impact Analysis – Wetlands

SEA evaluated the impacts of the Proposed Action and Alternatives on wetland resources, including the effects from construction, operation, and maintenance. The Applicants delineated the wetlands along the Build Alternatives and requested a jurisdictional determination of the delineation from the USACE. The USACE has field verified the wetland delineation for the Proposed Action but has not yet provided written confirmation.

The Proposed Action and Alternatives would potentially affect wetlands that are located within the right-of-way limits (approximately 40-150 feet in width) and could indirectly affect wetlands that are located near the construction footprint. The construction of any of the Build Alternatives would require the placement of fill material in some jurisdictional and non-jurisdictional wetlands. The placement of fill would cause a permanent loss of wetland functions. However, some of the jurisdictional wetlands along Horsepen Bayou, Armand Bayou, Spring Gully, Big Island Slough, and Taylor Bayou would be bridged, which would reduce the direct impacts. Indirect impacts, such as shading by the bridges, hydrologic modifications, and storm water runoff from the bridges, could alter the functions and composition of the wetlands. The USACE Section 404 permit process requires a comprehensive analysis of the steps taken to avoid and minimize wetland impacts. The USACE Section 404 permit and Section 401 Water Quality Certificate from the TCEQ would require mitigation to compensate for unavoidable impacts on jurisdictional wetlands. The impact evaluation is based on preliminary designs for the rail line provided by the Applicants. The impact footprint may be revised slightly as the design progresses, but these design refinements are not expected to materially change the expected impacts.

4.7.5.1 Build Alternatives

The Proposed Action would potentially affect about 50 wetland areas, including about 17 jurisdictional sites and about 33 non-jurisdictional sites delineated within the proposed right-of-way. In addition, the 52-acre wetland mitigation site located to the east of Ellington Field would be bisected. Approximately 2.84 acres of jurisdictional wetlands and about 4.22 acres of non-jurisdictional wetlands were delineated in the right-of-way for the Proposed Action. The amount of jurisdictional wetland actually filled by the Proposed Action would be about 2.70 acres.

The Build Segments of Alternatives 2B and 2D would have the same impact to jurisdictional wetlands to that described for the Proposed Action (Table 4.7-3). The Original Taylor Bayou Crossing and Alternative 1C would impact more jurisdictional wetland acreage than the Proposed Action. Alternatives 2B and 2D would impact the greatest amount of non-jurisdictional wetland and Alternative 1C would impact the least amount of non-jurisdictional wetlands. Alternatives 2B and 2D would avoid the 52-acre wetland mitigation site that is located near Ellington Field. All of the Build Alternatives would cross the most important and largest area of jurisdictional wetlands located along Big Island Slough and Armand Bayou at the same location and with the same bridge design. Therefore, they would have the same impact. However, the Original Taylor Bayou Crossing would cross Taylor Bayou at a different location from the other Alternatives and would impact more jurisdictional wetlands, including about 0.18 acres more of gilgai habitat and about 0.77 acres more of tidal marsh.

Construction Impacts. The impacts on wetlands from construction of the Build Alternatives would be moderate. The use of construction BMPs, designs that reduce the impact of the railroad, good siting, and the use of bridges and retaining walls where possible would minimize the direct wetland impact. For example, the location of the Proposed Action's crossing of Taylor Bayou was selected to reduce wetland impacts because this location already has a road and railroad crossing and has a narrower tidal marsh. All of the proposed bridges would span some jurisdictional wetlands associated with the streams. In addition, the Applicants have indicated that in the coastal prairie wetlands near Ellington Field, small berms would be constructed, where possible, on the outside of the proposed drainage ditches if an isolated wetland is bisected by or adjacent to the construction footprint. The berms would be constructed of low permeability soil. Figure 4.7-1 illustrates the design of the berms. The Applicants also propose to install pipe culverts, where practicable, through the proposed railroad bed to minimize the disruption of surface water drainage patterns in these coastal prairie wetlands. These actions would help prevent alteration of the surface drainage pattern and the wetland hydrology.

All filling of jurisdictional wetlands would require a Section 404 permit from the USACE and a Section 401 Water Quality Certificate from the TCEQ. The permit process requires an Alternatives analysis that demonstrates avoidance and minimization of wetland impacts. The permit would contain conditions to minimize the impact to wetlands during construction and would require compensation for unavoidable impacts to jurisdictional wetlands. The Applicants have developed a conceptual compensation plan that was submitted with the Section 404/401 Joint Permit Application. The conceptual plan offers compensation for jurisdictional and nonjurisdictional wetland impacts. The conceptual plan includes the purchase and preservation

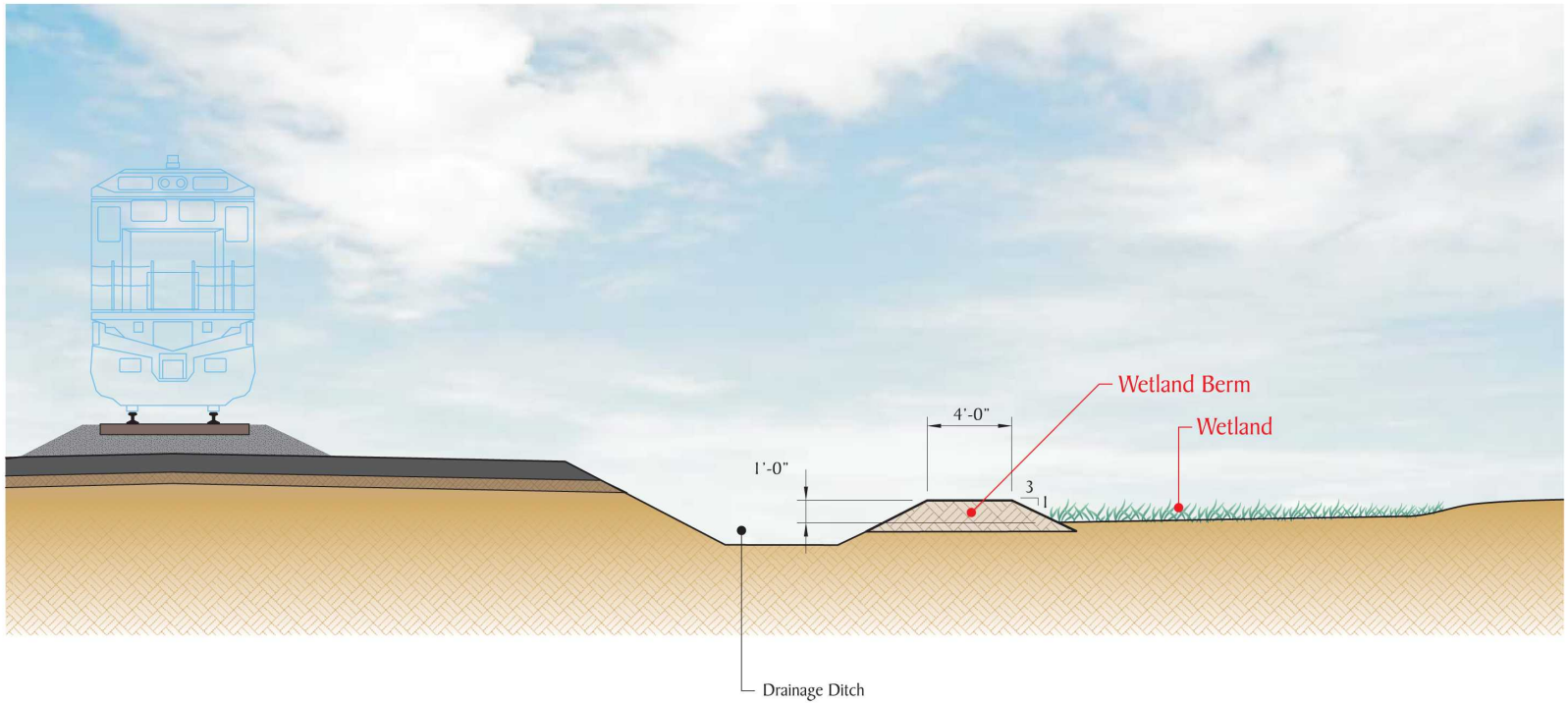
Table 4.7-3
Approximate Wetland Impacts of Build Alternatives
(within the proposed right-of-way)*

	Jurisdictional				Non-Jurisdictional		Total Jurisdictional (acres)	Total Non-Jurisdictional (acres)
	Tidal Marsh (acres)	Freshwater Emergent Wetland (acres)	Forested Wetland (Gilgai) (acres)	Disturbed Wetland (invaded by Tallow) (acres)	Coastal Prairie (acres)	Disturbed (i.e., partially drained, utility corridor) (acres)		
Proposed Action	0.36	0.03	0.57	1.88	1.00	3.22	2.84	4.22
Alternative 1C	0.36	0.35	0.57	1.88	1.00	2.48	3.16	3.48
Alternative 2B	0.36	0.03	0.57	1.88	5.99	0.56	2.84	6.55
Alternative 2D	0.36	0.03	0.57	1.88	6.00	0.56	2.84	6.56
Original Taylor Bayou Crossing	1.13	0.03	0.75	1.88	1.00	3.25	3.79	4.25

* Note 1 Area within the right-of-way is based on preliminary designs and may be revised slightly as the design proceeds.

2 Impacts from actual fill placed in wetlands should be slightly less than the amount in the right-of-way. For example, preliminary design for the Proposed Action shows an actual impact to 2.70 acres of jurisdictional wetlands compared to 2.84 acres in the right-of-way.

Figure 4.7-1
Berm Construction to Protect Coastal Prairie Wetlands



of approximately 24 acres of bottomland hardwood in the Armand Bayou watershed, which would include about 1.5 acres of gilgai wetlands. The Applicants also propose to purchase and preserve about 24 acres of coastal prairie habitat near Space Center Boulevard, which would include approximately 5 to 6 acres of non-jurisdictional isolated wetlands. In addition, the Applicants propose to regrade an impacted shoreline along Taylor Bayou near Port Road, remove debris in the water, and create approximately 0.32 acres of tidal marsh. The Applicant's proposed mitigation plan has not yet been approved by the regulatory agencies. SEA has concluded that the Build Alternatives would have moderate impacts on wetlands.

The Build Alternatives would involve new construction in wetlands, which requires a Wetlands Finding according to Executive Order 11990 "Protection of Wetlands." The FAA and NASA have reached a preliminary determination regarding the Proposed Action (for both the FAA and NASA) and Alternative 1C (for NASA) that construction in wetlands could not be avoided by the practicable Build Alternatives because of the linear nature of the proposed project. Practicable measures to avoid and minimize wetlands have been incorporated and a conceptual mitigation plan has been developed by the Applicants to compensate for unavoidable impacts. For those reasons, the Build Alternatives would be in compliance with Executive Order 11990.

Operation and Maintenance Impacts. During the operation of the Build Alternatives, accidents or equipment failure could result in a release of hazardous materials into the adjacent wetlands. The potential for a hazardous materials release and associated impacts are evaluated in Section 4.2. Railroad maintenance could include repairs to the tracks and associated structures (maintenance roads, ditches, bridges, and culverts) and ditch and culvert clean-out. These activities would be of short duration, relatively infrequent, and if they were located in wetlands, would be performed in accordance with any permit requirements. Stormwater discharges from the proposed ditches may convey stormwater and low concentrations of pollutants to wetlands located along the receiving waterways and drainage channels. SEA expects that operation and maintenance activities would have a minor impact on wetlands.

The Build Alternatives would require the use of existing rail lines. That portion of the Build Alternatives would not require construction of a new rail line and would avoid direct wetland impacts. However, because there would be an increase in traffic on the lines, there would be a very slight increase in the potential for a hazardous materials release to affect wetlands located along the lines.

4.7.5.2 No-Build Alternative

Wetlands would not be directly affected if BNSF uses the existing UP lines to access the Bayport Loop because no new construction would be needed. However, this Alternative would cause a negligible increase in the potential for a hazardous materials release to affect wetlands. The existing train traffic on the UP lines includes hazardous materials shipments, which would increase, with the exception of the Bayport Loop Industrial Lead and Strang Subdivision, which would remain the same.

4.7.5.3 No-Action Alternative

The No-Action Alternative would not involve construction of a railroad line and would not affect wetlands. Wetland impacts associated with the construction, operation, and maintenance of the Build Alternatives would be avoided. The existing train traffic on the UP line includes hazardous materials shipments. The No-Action Alternative would not change the existing potential for wetland contamination resulting from a hazardous materials spill on the UP line.

4.8 BIOLOGICAL RESOURCES

4.8.1 Methodology

SEA evaluated the effects of the Proposed Action and Alternatives on biological resources, including potential effects on the plant communities, fish and wildlife resources including EFH, and threatened, endangered, and rare species. SEA also examined potential biological resource effects from increased rail traffic on the existing rail lines that would result from any of the Build Alternatives. Appendix J includes a more detailed discussion of the methodology used in the analyses.

SEA based the evaluation of impacts on interpretation of the data collected from numerous reports, regulatory documents and guidance manuals, from discussions with resource agency personnel, and from GIS analysis. GIS was used to determine the acreage of various plant communities and EFH that could be disturbed within the right-of-way of the Build Alternatives. The acreage calculation assumed a 40 to 150 foot right-of-way throughout the project corridor with some areas of wider right-of-way for grade separated crossings at Space Center Boulevard and Red Bluff Road, for staging areas and laydown areas, and at the crossing of Armand Bayou. A wider right-of-way would also be needed for borrow areas, which would provide the fill for the Build Alternatives. However, the exact locations, number, and size of borrow areas that would be needed is not known. The Applicants have stated that the borrow areas would likely be located adjacent to or nearby the right-of-way and have committed to siting those areas outside of bottomland hardwoods and coastal prairies.

4.8.2 Impact Analysis – Plant Communities

SEA evaluated the potential impact on plant communities located within the project area. The evaluation included construction impacts and operational and maintenance related impacts. In general, much of the project area is already developed or affected by disturbance from cattle and feral pigs and invasion by Chinese tallow. The Build Alternatives would affect some unregulated plant communities that are relatively uncommon in the region. For example, some remnant coastal prairie that exists to the east of Ellington Field and bottomland hardwood forests along the major waterways, especially Armand Bayou and Big Island Slough, would be impacted. Table 4.8-1 summarizes the acreage of various plant community types that occur within the right-of-way for the Build Alternatives. The impact evaluation is based on preliminary designs for the rail line provided by the Applicants. The impact footprint may be revised slightly as the design progresses, but these design refinements are not expected to materially change the expected impacts.

Table 4.8-1
Acreage of Plant Community Types Affected by the Alternatives

	Coastal Prairie[1]	Bottomland Hardwood[2]	Chinese Tallow Dominated[3]	Improved Grassland/ Pasture
Proposed Action	18.65	11.63	8.10	64.57
Alternative 1C	18.64	11.63	1.76	62.29
Alternative 2B	22.15	11.63	17.64	48.69
Alternative 2D	22.15	11.63	16.15	48.62
Original Taylor Bayou Crossing	18.65	13.92	11.27	59.18

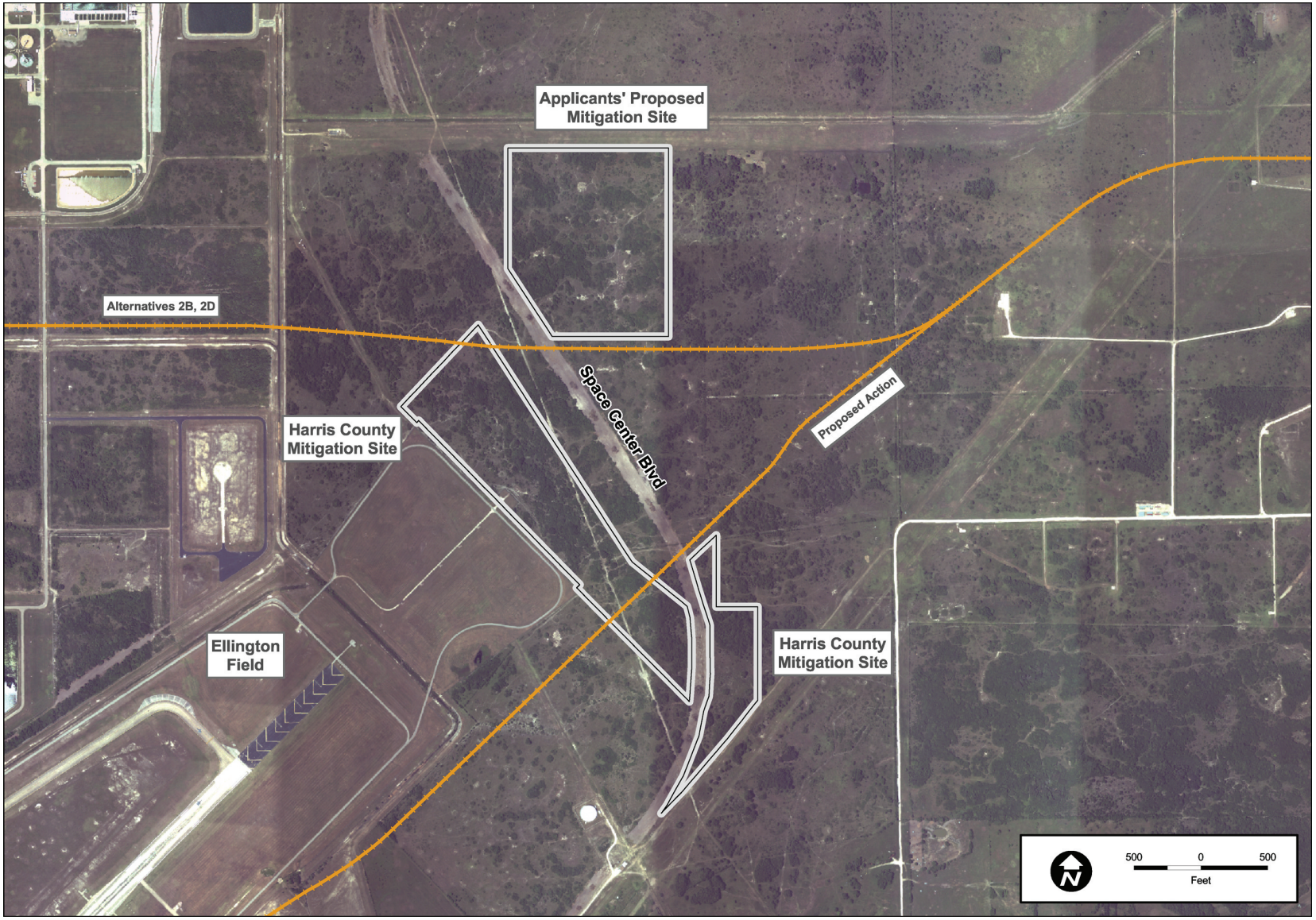
Notes: 1. Includes areas of coastal prairie with Chinese tallow trees.
2. Includes areas of bottomland hardwood with Chinese tallow trees.
3. Includes areas of Chinese tallow with remnant bottomland hardwood.

4.8.2.1 Build Alternatives

Construction Impacts. The construction of the Build Alternatives would require the clearing of existing vegetation within the right-of-way, which would typically be a 40 to 150 foot wide corridor. The proposed right-of-way would be wider where grade separated crossings, construction staging and laydown areas, and borrow sites would be located. Much of the corridor for the Build Alternatives has already been developed by agricultural, institutional, industrial, and oil/gas development, invaded by Chinese tallow trees, or disturbed by feral pig and cattle activity. Approximately one half of the Build Segment of the Proposed Action would parallel existing pipeline, transmission line, or roadway corridors that have little to no natural habitat remaining. Some natural habitat would be permanently lost by the construction of the road and rail line bed or would be converted to maintained slopes or ditches. The Proposed Action would cause a loss of about 18.65 acres of coastal prairie and 11.63 acres of bottomland hardwood forest, although some of these areas have already been invaded by Chinese tallow trees. Past development in the Houston and Galveston area has already converted and fragmented much of the bottomland forest and coastal prairie that was once prevalent along the Gulf Coast. Therefore, remnant forest and coastal prairie communities are considered an important ecological resource by the environmental resource agencies (TPWD, 2001; Harris County, 2001; USFWS, 2002).

The Build Alternatives would fragment some of the bisected plant communities, and thereby affect some biological functions. However, the Applicants have proposed several measures to mitigate the impacts to coastal prairie and bottomland hardwood forests. The Applicants propose to use low permeability berms adjacent to ditches and to install pipe culverts through the railroad bed in order to minimize the potential impact on surface drainage patterns in the coastal prairie habitat near Ellington Field. In addition, the Applicants have a conceptual plan to acquire and preserve about 24 acres of bottomland hardwood forest in the Armand Bayou watershed and about 24 acres of coastal prairie near Space Center Boulevard (see Figure 4.8-1). The Applicants have also committed to implement a noxious weed control program within the right-of-way and to ensure that construction staging areas are not located in bottomland hardwoods or coastal prairie habitat. Finally, the Applicants have committed to revegetate the proposed drainage

Figure 4.8-1
Proposed Mitigation Sites Near Space Center Boulevard



ditches using native seed sources from stockpiled soil, to the extent practicable. The Build Alternatives would have moderate impact on plant communities.

Operation and Maintenance. During operation of the Build Alternatives, accidents or equipment failure could result in a release of hazardous materials into the adjacent plant communities. The potential for a hazardous materials release and discussion of the associated impacts are located in Section 4.2.

Maintenance of the upland portions of the Build Alternatives may include periodic herbicide application to control vegetation. Herbicides could affect the surrounding plant communities if improperly applied. All herbicide would be used below the application rate recommended by the manufacturer or supplier and in accordance with regulatory requirements. Maintenance would also include occasional mowing of established vegetation within the right-of-way and periodic disturbance for rail, road, and ditch maintenance. The Applicants have committed to implementing a noxious weed control program within the right-of-way. Maintenance and operational activities would have negligible impact on the surrounding plant communities.

The Build Alternatives would all require the use of existing UP lines. This operational portion of the Build Alternatives would not require construction and therefore would avoid affecting plant communities directly. However, because there would be an increase in traffic on the lines, there would be a very slight increase in the potential for a hazardous materials release, which could impact plant communities.

4.8.2.2 No-Build Alternative

Plant communities in the project area would not be directly affected if BNSF uses the existing UP lines to access the Bayport Loop because no new construction would be needed. Therefore, compared to the Build Alternatives, this Alternative would result in less impact to plant communities. However, this Alternative would cause a very slight increase in the potential for hazardous materials releases to affect the surrounding plant community. The existing train traffic on the existing UP lines includes hazardous materials shipments, which would increase on all of the lines with the exception of the Bayport Loop Industrial Land and Strang Subdivision, which would remain the same.

4.8.2.3 No-Action Alternative

The No-Action Alternative would not involve construction of a new railroad line. Therefore, impacts on plant communities associated with the construction, operation, and maintenance of the Build Alternatives would be avoided. The No-Action Alternative would not change the existing potential for contamination of plant communities resulting from a hazardous materials spill on the UP line.

4.8.3 Impact Analysis – Fish and Wildlife Resources Including EFH

SEA evaluated the potential impacts on wildlife by fragmentation or loss of existing wildlife habitat, from the disruption of wildlife migration corridors, from noise, and from wildlife

fatalities. SEA also evaluated potential impacts on EFH and fish communities. The evaluation considered construction, operation, and maintenance activities. The potential impacts on EFH are summarized in Table 4.8-2 and discussed below. The impact evaluation is based on preliminary designs for the rail line provided by the Applicants. The impact footprint may be revised slightly as the design progresses, but these design refinements are not expected to materially change the expected impacts.

Table 4.8-2
EFH Impacts for the Alternatives

EFH Type	Impact on EFH from the Build Alternatives	
	Proposed Action, Alternatives 1C, 2B, 2D	**Original Taylor Bayou Crossing**
Tidal Marsh	0.11 acres	0.05 acres
Tidal Shrub	0.14 acres	1.07 acres
Substrate	173.6 ft^2	156.8 ft^2
Open Water (Direct)	1,444.4 ft^3	117,609.7 ft^3
Open Water (Indirect from shading)	0.78 acres*	0.55 acres*

* Actual impact should be approximately 30 percent less because some sunlight could penetrate through the bridge crossties and from the sides due to the height of the bridge above water.

4.8.3.1 Build Alternatives

Construction Impacts. The construction of the Proposed Action would require the clearing and grading of a 12.8-mile long rail corridor with a right-of-way width of 40 to 150 feet. The total acreage within the right-of-way would be approximately 131 acres. The other Build Alternatives would require similar acreage. The clearing of the corridor would result in a loss of some natural habitat, would fragment some wildlife habitat, and potentially disrupt wildlife movement. However, about 50 percent of the right-of-way for the Proposed Action is located adjacent to existing pipeline, transmission line, or roadway corridors that already have fragmented the wildlife habitat. About 22 percent of the proposed right-of-way for the Proposed Action is already developed or maintained. In addition, an important wildlife migration corridor along the floodway of Armand Bayou would be partially spanned by the bridge thereby reducing the disruption to this corridor. The Proposed Action may displace some wildlife species, although the wildlife in the project area would probably adjust to the additional fragmentation because they have already adapted to this type of environment.

The Applicants have committed to conducting a survey for nests of the Northern Caracara if Alternative 2B or 2D is selected for construction. The survey would be completed in accordance with USFWS requirements under the Migratory Bird Treaty Act. The Northern Caracara is the only regulated species, observed in the project area, which uses the same nest each year. Therefore, there is some potential for the loss of a nest if Alternative 2B or 2D were built, which would possibly require a permit from the USFWS.

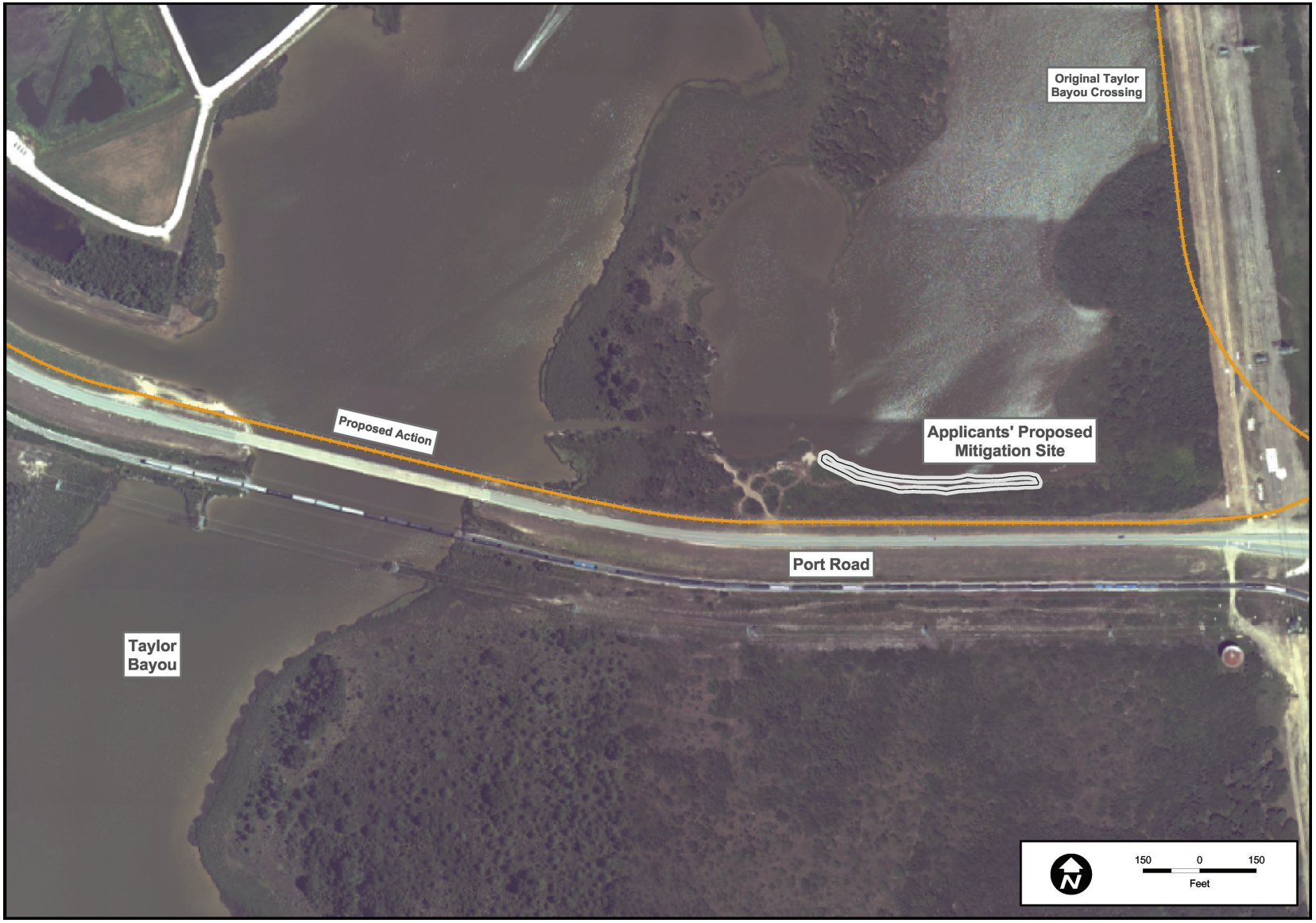
The use of mechanized equipment for the clearing and railroad construction would increase the noise levels during construction activities. The construction would be completed within about 16 to 21 months and therefore the most significant disruption to wildlife from noise would be temporary. The disruption to wildlife is expected to cause minor impacts because wildlife in this area are already accustomed to noise and disturbance from the existing industrial activity, air traffic from Ellington Field, and vehicle traffic on the nearby roads. In addition, the wildlife should be able to acclimate due to their mobility and ability to avoid the impacted areas.

According to the National Oceanic and Atmospheric Administration (NOAA) and Gulf of Mexico Fishery Management Council (1998), Taylor Bayou has EFH for the white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), red drum (*Sciaenops ocellatus*), and the Spanish mackerel (*Scomberomorus maculates*) throughout its tidal reach. The EFH for these species varies according to species and life stages, but includes the estuarine emergent and shrub wetlands, and the water column and substrate. The proposed crossing location for all Build Alternatives would impact emergent wetlands and water column and substrate EFH. The proposed bridge crossing of Taylor Bayou for the Proposed Action and Alternatives 1C, 2B, and 2D would span much of the EFH, but would have minor impacts on EFH from the construction of piers/pilings, and possibly from the shading of emergent wetlands and open water and the discharge of stormwater (Table 4.8-2). The EFH impacts would include a permanent loss of about 0.11 acres of tidal emergent wetland, 0.14 acres of tidal shrub wetlands, 1,444 cubic feet of water column, and 174 square feet of substrate. The bridge deck could cause an indirect impact on about 0.78 acres of open water due to shading, although the actual impact should be about 30 percent less because the bridge design should allow some sunlight penetration.

The impacts to EFH from the Original Taylor Bayou Crossing Alternative would be greater and would include a permanent loss of about 0.05 acres of tidal emergent wetlands, 1.07 acres of tidal shrub wetlands, 117,610 cubic feet of water column, and 157 square feet of substrate. The bridge deck could cause an indirect impact on about 0.55 acres of open water due to shading, although the actual impact should be about 30 percent less because the bridge design should allow some sunlight penetration.

To compensate for EFH impacts, the Applicants have proposed to remove debris along a section of shoreline of Taylor Bayou near Port Road (see Figure 4.8-2), to regrade the steep slope, and create about 0.32 acres of tidal marsh to mitigate for the impacts on EFH. Plantings of smooth cordgrass would be used to create a tidal marsh. This mitigation would restore aquatic substrate and water column and create tidal marsh. As stated in Section 4.8.2.1, the Applicants have committed to preserving about 24 acres of coastal prairie and about 24 acres of bottomland hardwood, which would mitigate for the impacts to wildlife habitat. Appendix J includes a more detailed assessment of the impact to EFH and includes consultation documentation required by the NMFS under the MSFCMA. The impact on EFH from the Build Alternatives is expected to be minor. On October 22, 2002 the NMFS responded to SEA's EFH Assessment Report. NMFS recognized "that the project applicant has minimized impacts to EFH" but has requested a more detailed mitigation plan. The Applicants submitted a more detailed plan to NMFS on November 7, 2002, which has yet to be evaluated. SEA will continue to coordinate with NMFS to ensure

Figure 4.8-2
Applicants' Proposed Mitigation Sites Near Taylor Bayou and Port Road



that the proposed mitigation plan is acceptable and meets all requirements of the Magnuson-Stevens Fishery Conservation and Management Act.

The in-stream construction activities could have the potential to disturb other fish species and aquatic communities. However, the short duration of activities, use of bridges for all jurisdictional crossings, use of BMPs, and compliance with all regulatory requirements would ensure that impacts are minor.

Operation and Maintenance. During operation of the Build Alternatives, accidents or equipment failure could result in a release of hazardous materials, which could affect fish and aquatic communities, EFH, wildlife, and wildlife habitat. The potential for a hazardous materials release and evaluation of the associated impacts are included in Section 4.2. In addition, the operation of a rail line could potentially cause disruption to wildlife movement from noise and train movement and wildlife fatality due to collisions with rail cars. Most of the wildlife found in this area have already adapted to living in a fragmented and disturbed environment. Because the trains would have a maximum speed of 20 mph over the proposed new rail line and because the Applicants would operate an average of only two trains per day, SEA expects a negligible impact.

Operation of the Build Alternatives would result in stormwater discharges from the proposed drainage ditches to waterbodies and EFH. BMPs for post-construction TSS control would be required by the TCEQ through the Section 401 Water Quality Certification. Stormwater discharges would also have to meet the "first ½ inch" treatment requirements of Harris County's Stormwater Quality Permit. In-stream maintenance activities would be performed in accordance with any required local, state, and Federal permits. In addition, SEA expects the pollutant concentrations in the stormwater discharge to be low because no material storage areas are proposed and because the train traffic would be minimal. Therefore, the impacts on fish communities and EFH from operation of the proposed rail line would be negligible.

The Build Alternatives would also require the use of the existing UP lines, which would avoid direct impacts on fish and wildlife resources. However, because there would be an increase in traffic on the lines there would be a very slight increase in the potential for a hazardous materials release.

4.8.3.2 No-Build Alternative

Fish and wildlife resources in the project area would not be directly affected if BNSF uses the existing UP lines to access the Bayport Loop because no new construction would be needed. Therefore, compared to the Build Alternatives, this Alternative would result in less impact on fish and wildlife resources. However, this Alternative would cause a very slight increase in the potential for a hazardous materials release to affect fish and wildlife resources. The existing train traffic on the UP lines includes hazardous materials shipments, which would increase on all of the lines with the exception of the Bayport Loop Industrial Lead and Strang Subdivision, which would remain the same.

4.8.3.3 No-Action Alternative

The No-Action Alternative would not involve construction of a railroad line. Therefore, impacts on wildlife and fish communities and EFH associated with the construction, operation, and maintenance of the Build Alternatives would be avoided. The No-Action Alternative would not change the existing potential for contamination of wildlife and fish habitat resulting from a hazardous materials spill on the UP line.

4.8.4 Impact Analysis – Endangered, Threatened and Rare Species

SEA evaluated the effects of the Proposed Action and Alternatives on endangered, threatened, and rare species. This evaluation included the effects from construction, operation, and maintenance activities. The project area includes multiple locations inhabited by the state and Federally-listed endangered Texas prairie dawn near Ellington Field. A total of 100 potential sites were surveyed for the Texas prairie dawn in the project area and 18 of the sites had populations. No other state or Federally protected species, candidate species, or rare species were found to exist in the project area. However, some special status species may occasionally visit the area and some state rare species may inhabit the project area.

4.8.4.1 Build Alternatives

Construction Impacts. The construction of the Proposed Action would not directly affect or cause a taking of a Texas prairie dawn plant. The right-of-way for the Proposed Action would be about 39 feet away from one fairly large population. The majority of field survey sites where Texas prairie dawn populations were found are located near the Build Segments of Alternatives 2B and 2D. Therefore, the potential impact on the Texas prairie dawn is slightly greater for these Build Alternatives compared to the Proposed Action. Alternatives 2B and 2D would be about 43 feet from one population and about 50 feet from another population. The sites were typically found to have healthy populations in excess of 100 individual plants. However, several of the sites had experienced a moderate level of disturbance by feral pigs and cattle.

According to the USFWS, the alteration of hydrology in the areas adjacent to the Texas prairie dawn population has some potential to affect the local surface water hydrology, which is potentially important for Texas prairie dawn seed dispersal and its continued existence. SEA evaluated the Applicants' zone of influence analysis of the proposed stormwater drainage channels. This analysis evaluated the potential alteration of the hydrology of adjacent areas. A typical drainage channel would have a zone of influence of 10 feet or less and therefore would have negligible impact on the hydrology of any of the populations.

The Applicants have informed SEA that they plan to construct small, low permeability berms in situations where a coastal prairie wetland or Texas prairie dawn population is adjacent to the corridor. Some of these isolated coastal prairie wetlands are located adjacent to the Texas prairie dawn populations. In addition, the Applicants propose to install pipe culverts through the railroad bed along this portion of the corridor (where possible). The proposed berms and pipe culverts would reduce the alteration to the surface hydrology and would avoid indirect impacts to the Texas prairie dawn populations. The Texas prairie dawn survey, zone of influence analysis,

and proposed berm construction were submitted to the USFWS and TPWD for their review and were accepted by the USFWS on August 1, 2002. The Applicants have proposed to purchase and preserve a 24-acre coastal prairie habitat, which includes multiple populations of the Texas prairie dawn (see Figure 4.8-1). SEA has determined that the Build Alternatives would have no effect on the Texas prairie dawn or other listed species or their designated critical habitat. Therefore, the Build Alternatives would be in compliance with the Federal Endangered Species Act. The USFWS has concurred with this determination as required by Section 7 of the Endangered Species Act (USFWS, August 1, 2002). The State of Texas does not have the regulatory authority to limit impacts to state-listed plant species on private property. Nevertheless, SEA is continuing to coordinate with the TPWD concerning the Texas prairie dawn.

Operation and Maintenance. During operation of the Build Alternatives, accidents or equipment failure could result in a release of hazardous materials into the adjacent areas, potentially affecting the Texas prairie dawn. The potential for a hazardous materials release and associated impacts are described in Section 4.2.

SEA has identified no other operational activities that could impact the Texas prairie dawn.

Maintenance of the upland portions of the Build Alternatives may include periodic herbicide application to control vegetation within the railroad right-of-way. Herbicides potentially could impact the Texas prairie dawn if herbicide drift occurred. All herbicides would be used below the application rate recommended by the manufacturer and in accordance with all Federal and state laws. Therefore, such operational activities are expected to have negligible impacts.

The Build Alternatives would all require the use of the existing UP lines, which would not involve the construction of a new railroad line and therefore would avoid direct impacts on Federally and state protected species. However, because there would be an increase in traffic on these lines, there could be a very slight increase in the potential for a hazardous materials release, which could impact a protected species if it was located near the release.

4.8.4.2 No-Build Alternative

Federally and state protected species would not be directly affected if BNSF uses the existing UP lines to access the Bayport Loop, because no new construction would be needed. Therefore, compared to the Build Alternatives, this Alternative would result in less impact on protected species. However, this Alternative would cause a very slight increase in the potential for a hazardous materials release. The existing train traffic on the UP lines includes hazardous materials shipments, which would increase on all of the lines, with the exception of the Bayport Loop Industrial Lead and Strang Subdivision, which would remain the same.

4.8.4.3 No-Action Alternative

The No-Action Alternative would not involve construction of a new railroad line. Therefore, the potential impacts on Federally and state protected species associated with the construction, operation, and maintenance of the Build Alternatives would be avoided. This Alternative would

not change the existing potential for the contamination of special status species resulting from a hazardous materials spill on the UP lines (if special status species inhabit the area).

4.9 TOPOGRAPHY, GEOLOGY AND SOILS

4.9.1 Methodology

SEA evaluated the proposed rail line to determine whether the proposed construction and operation would substantially affect local topography, geology, and soils. The analysis included a review of topographic maps, relevant published reports, and preliminary rail line design information.

4.9.2 Impact Analysis

SEA anticipates no significant impacts on topography, geology, and soils due to the construction and operation of the Proposed Action or Alternatives.

4.9.2.1 Topographic Impacts

The Build Alternatives would result in minor changes in topography along the right-of-way of the proposed rail line to ensure a flat rail bed and smooth grades. Due to the flat natural topography, most of the length of the rail line would be at or near the natural grade with only small changes to fill depressions or reduce high spots. These changes would be on the magnitude of only several feet. The largest topographic changes would occur at road/rail grade-separated crossings where the rail line or road would gradually rise above the adjacent topography.

The No-Build Alternative and the No-Action Alternative do not involve new construction and therefore, would not result in any topographic changes.

4.9.2.2 Geologic Impacts

None of the Alternatives involve actions that would affect geologic conditions or hazards in the area. The only geologic hazard in the area is the potential for faulting or subsidence due to water and hydrocarbon extraction. Neither the No-Action or No-Build Alternatives nor development of any of the Build Alternatives would necessitate extraction of water or gas. Therefore, no effect on geologic conditions is anticipated.

4.9.2.3 Soil Impacts

Only minor soil erosion is projected during construction of the Build Alternatives. Surface soils would be disturbed as an unavoidable aspect of the construction process. The naturally flat topography and the standard erosion control practices that would be employed would minimize the potential for erosion to occur. These practices include minimizing the disturbed areas, replanting vegetation as soon as practical after construction, and spraying the disturbed areas with water to reduce the potential for fugitive dust.

The No-Build Alternative and the No-Action Alternative do not involve new construction and therefore, would not affect soils.

4.10 LAND USE

4.10.1 Methodology

SEA considered the potential land use impacts from the construction and operation of the Build Segments. SEA analyzed the Build Segments for compatibility with local land uses and local agency land use plans. SEA also analyzed potential effects on the Runway Protection Zones at Ellington Field, on Coastal Zone Management, and on prime farmland. The acquisition and use of the right-of-way could affect local land use if the Build Segments change the area's current development trends or alter local land use policies.

4.10.2 Impact Analysis – Land Use

4.10.2.1 Build Alternatives

SEA analyzed the land use effects of the Build Segments. The Proposed Action turnout from the GH&H line would be located at the southeast corner of Ellington Field. The Proposed Action would encroach on approximately 3.5 acres of the Runway Protection Zone for runway 35L. However, the FAA has determined that there is no air space conflict with the portion traversing the Runway Protection Zone. Alternative 1C would run outside the Runway Protection Zone and was developed to avoid any potential conflict.

The Proposed Action would run between the original Ellington Field boundary and the 240-acre parcel of land that the City of Houston purchased to prevent residential development from encroaching any further upon the airport. The master plan for Ellington Field is in its beginning stages, and the land use and development options currently include the possibility of developing this land for a mixture of office, retail, light industrial, aviation, and aviation industry use. The City's concern, expressed during the scoping period, involved the potential of the Proposed Action to limit the utility of the 240 acres for aeronautical use and the potential to limit revenue prospects for the land (City of Houston, 2002). Subsequent to the scoping process and the selection of Alternatives for detailed analysis in the DEIS, the Houston Airport System commissioned a Draft Site Suitability Analysis for the Ellington Field Master Plan Update (Leigh Fisher Associates, 2002). The Draft Site Suitability Analysis indicates that Ellington Field has approximately 700 acres available for development. The analysis recommends that based on projected aviation activity, "up to 50 acres should be reserved to accommodate growth in a generation aviation." The analysis states that approximately 45 acres were reserved for general aviation immediately north of the existing T-hangars and west of the traffic control tower. Additional land is available on the north edge of the airport if needed. The analysis indicates that the area labeled as the "Southeast Ellington Field Area," which encompasses the 240 acres, is the closest to residential development of all the Ellington Field development areas. Therefore, it recommends office and light industrial uses for the land closest to the residential area and heavier industrial development closer to the airport. It also indicates that the area closest to the airport could have airfield access if desired and, therefore aviation and/or aviation

industrial uses would be appropriate. However, based on the aviation forecast and the recommendation to use other areas for aviation use, it does not appear reasonably foreseeable that the southeast Ellington Field area would be used for aviation use. No adverse land use impact would be created if the land was developed for non-aviation use (e.g., business or industrial park). Alternative 1C would run along the southeast perimeter of this 240-acre parcel and would have no adverse impact on its potential development use.

The City of Houston is also considering a new road that would connect Space Center Boulevard with SH 3. The new road would be used to provide additional access to Ellington Field and would be located around the boundary of the 240-acre parcel. This new road would intersect with the rights-of-way for the Proposed Action and Alternative 1C, and it appears as if it would also encroach on the Runway Protection Zone for runway 35L near the Proposed Action turnout from the GH&H line (Houston Airport System, 2002). Construction of the Proposed Action or Alternative 1C could conflict with this potential access road.

Alternative 1C would pass over a pipeline corridor and come within approximately 550 feet of the closest residence in Clear Lake City. It would be separated from Clear Lake City by a drainage ditch and the pipeline corridor. There is no plan for residential or industrial development within the Alternative 1C right-of-way.

The Proposed Action and Alternative 1C would connect on the northwest side of NASA's Sonny Carter Training Facility. Alternative 1C then would traverse the NASA access road to Ellington Field, parallel to runway 4/22. The City has indicated that the Proposed Action may adversely affect construction of a parallel taxiway on the eastern side of runway 4/22. The City does not have any current plans to construct the taxiway, but the airport master plan may eventually include one. The March 1987 Ellington Field ALP shows a planned parallel taxiway on the western side of runway 4/22.

The Proposed Action would cross Space Center Boulevard northeast of runway 4/22, outside of its Runway Protection Zone. The Applicants have stated that the crossing would be grade-separated. The Applicants have completed a Notice of Proposed Construction or Alteration, as required by 49 U.S.C. 44718, and submitted the form to FAA. FAA has determined that the grade-separated crossing would not affect the vertical clearance requirements for takeoffs and landings. However, FAA initially indicated that the Instrument Landing System (ILS) signal on runway 22 could be degraded while trains use the track parallel to the runway. FAA stated that the system could be made unreliable during this critical phase of flight due to signal reflection. The Applicants conducted a glide slope evaluation study, which concluded that neither the Proposed Action nor Alternative 1C would adversely impact the ILS or the glide scope. FAA reviewed the study and concurred with this conclusion.

The City of Pasadena has plans to develop the area to the south of the Pasadena Convention Center with a mixture of uses. Current plans include proposals for a light industrial district. The Build Alternatives would not pass through the land proposed for development. There is no conflict with the Pasadena Light Industrial District project.

The Build Alternatives would have a minor adverse effect on land use at the crossing of Armand Bayou because they would alter the use from a semi-natural environment with trees and vegetation by adding a rail right-of-way and bridge structure. A pipeline and power line right-of-way currently crosses Armand Bayou at the same point, so the additional effects of a rail bridge would not be totally out of character with the existing land use at that location. Another bridge is located several hundred yards downstream from the proposed crossing.

The Build Alternatives would cross Red Bluff Road with a grade-separated crossing. The City of Pasadena is considering construction of a new trail called the Armand Bayou Trail (City of Pasadena, 2001) that would connect Jana Lane to Bay Area Boulevard. At the proposed Build Alternatives' crossing of Red Bluff Road, the trail could run along the west side of Red Bluff Road. Given the low volume of rail traffic expected on the proposed new rail line, there would be no conflict with the new trail, if it were to intersect with the rail line at-grade. Another possible route for the trail would be to utilize the grade-separated crossing, which is proposed under the Build Alternatives. The Build Alternatives have no adverse effect on existing land use conditions over the rest of the alignment through the Bayport Industrial District.

Alternatives 2B and 2D would cross land owned by the Water Treatment Plant. The City of Houston has expressed concern over the proximity of a new rail line to its Water Treatment Plant and has stated that any new rail line that would be adjacent to, or divide the Plant creates an unnecessary and unacceptable risk. Alternatives 2B and 2D also would cross Space Center Boulevard using a grade-separated crossing. The FAA has determined that there is no air space conflict for this proposed grade-separated crossing.

The Build Alternatives do not conflict with the Harris County Parks Master Plan (Bricker & Cannady Architects, 2001) because there are no plans to acquire any new land in the affected area.

According to the Applicants, approximately 18 different industrial or municipal landowners would be directly affected by the Proposed Action, with ExxonMobil, Inc. the largest single landowner. The Applicants have stated that they selected the Proposed Action route to avoid incompatible land uses and minimize conflicts with landowners.

Construction of the Build Alternatives would not lead to increased pressure to develop the land along the alignment for industrial use. The absence of zoning regulations in Houston and Pasadena means that development pressures are subject to market forces and landowner decisions. The lack of development protections found under a planned zoning system means that the land in the project area could be developed for any mix of residential, commercial, or industrial use. The construction of a rail line, in an area that already contains several rail lines, would not adversely affect how private property is developed. The Clear Lake residential area has developed over time along the existing GH&H Line, which carries an average of 3.4 trains per day that include carloads of hazardous materials. This suggests that construction of a new rail line, carrying two trains per day, would neither hinder nor promote residential development opportunities in the Clear Lake area.

4.10.2.2 No-Build Alternative

SEA concluded that there would be no adverse effects on land use under the No-Build Alternative. BNSF operation of two trains per day between the Bayport Loop and the CMC Dayton Yard, via the existing Bayport Loop Industrial Lead and Strang, East Belt, Terminal, Lafayette, and Baytown Subdivisions, would not conflict with the existing land use conditions in the project area.

4.10.2.3 No-Action Alternative

SEA concluded that there would be no adverse effects on land use under the No-Action Alternative. UP would continue its rail operations and this would be entirely consistent with the existing land use conditions in the project area.

4.10.3 Impact Analysis – Coastal Zone Management

The USACE is coordinating evaluation of the Proposed Action and Alternatives to ensure compliance with the Texas Coastal Management Program. The Applicants would be required to submit an application for a Texas Coastal Management Program consistency certification to the USACE. The USACE would then forward the application to the Coastal Coordination Council of the Texas GLO, which would publish a public notice and initiate a 45-day consistency review process. The Coastal Coordination Council would issue a determination on consistency with the Texas Coastal Management Program. This consultation satisfies the requirements of the Federal Coastal Zone Management Act.

SEA has reviewed the Proposed Action and Alternatives and found them to be consistent with the goals and policies of the Texas Coastal Management Program, as stated in the *Texas Administrative Code, Title 31, Chapter 501*. The Proposed Action and Alternatives meet the goals and policies for transportation projects in that they incorporate pollution prevention procedures into construction and maintenance plans to minimize pollutant loading to coastal waters from erosion and sedimentation, use of pesticides and herbicides from maintenance of rights-of-way, and other pollutants from stormwater runoff. The Proposed Action and Alternatives would be located in areas that avoid and minimize the potential adverse effects from construction and maintenance of the rail line and would be located within existing rights-of-way and previously disturbed areas to avoid and minimize adverse effects. In addition, the construction and maintenance of the Build Alternatives would avoid the impoundment and draining of coastal wetlands to the maximum extent practicable and would occur at sites and times selected to have the least adverse effects practicable on recreational uses and on spawning or nesting seasons, or seasonal migrations of terrestrial and aquatic species. The Proposed Action and Alternatives would not affect the Gulf beaches or critical dune areas.

4.10.4 Impact Analysis – Prime Farmland

The NRCS identified 86.3 acres of prime farmland and 68.7 acres of statewide important farmland in the right-of-way for the Proposed Action. This yielded a composite score of 114 in the NRCS evaluation, less than the 160 rating score that would prompt additional consideration

for protection. Thus, according to the NRCS, further consideration is not needed. SEA has concluded that the Proposed Action and Alternative 1C would have a negligible effect on prime farmland.

The rights-of-way for Alternatives 2B and 2D would impact 80 acres of prime farmland. These Alternatives would have similar impacts to prime farmland as the Proposed Action and therefore, further consideration is not needed. SEA has concluded that Alternatives 2B and 2D would have a negligible effect on prime farmland.

4.11 SOCIOECONOMICS

4.11.1 Methodology

SEA analyzed the socioeconomic effects of the Proposed Action and Alternatives on the communities in the project area.

4.11.2 Impact Analysis – Demographics and Employment

Demographics and employment can be affected by activities conducted during the construction and operational phases of a proposed project, in both the short and long-term. SEA considers effects to be adverse if construction or operation of a proposed rail line causes displacement of a significant number of residents or businesses, if the new rail line causes significant levels of migration to an area, or if it severely affects employment demand in the local economy.

4.11.2.1 Build Alternatives

Construction and operation of the Build Alternatives is expected to have a negligible effect on demographics, employment, and the economy of the project area. Construction of the new rail line would take between 16 and 21 months and could be achieved within the confines of the local labor force. Construction may provide a small number of temporary new jobs. However, the proposed construction is not sufficiently extensive to affect local wages or employment demands. The population of Harris County is sufficiently large to absorb any small increase in jobs that rail line construction could generate. Construction of the proposed rail line would require a range of skilled workers, including heavy equipment operators, carpenters, electricians, landscapers, truck drivers, and mechanics. These positions would probably be filled by local workers and contractors. More specialized positions, such as rail construction contractors, may relocate from outside the project area for the duration of the construction phase.

Given the low level of rail traffic expected to operate on the proposed line, a significant number of new jobs would not be created by the operational phase of the Proposed Action or any of its Alternatives. The rail operations would probably be absorbed into BNSF's existing Houston area employment structure. Operation of the Proposed Action would not have appreciably different impacts on demographics and employment from the No-Action Alternative because the stated purpose of the Proposed Action is to introduce competitive rail service to the Bayport Loop, with the effect that the total number of loaded rail cars produced by the Loop's industries would not increase, but would be transported by a different rail company. Therefore, the total economic

output of the Loop's industries is unlikely to change in the foreseeable future as a result of this Proposed Action.

Construction and operation of the Build Alternatives would not displace any residents or businesses, except for Alternative 2B, which could moderately affect several businesses along Genoa-Red Bluff Road. However, the overall effects of this potential impact on the local economy would be negligible.

The Applicants have stated that construction of a new rail line in the project area would cost approximately $80 million. A substantial amount of this money could enter the local economy, but its effects on the local economy of Harris County would be negligible.

4.11.2.2 No-Build Alternative

No construction would be required to support the No-Build Alternative. Operation of two trains per day along the existing rail lines would not create demands for new jobs, or other impacts on demographics and employment.

4.11.2.3 No-Action Alternative

The No-Action Alternative involves UP continuing to transport Bayport Loop products over its rail lines. The No-Action Alternative will not create adverse impacts on demographics and employment in the project area. Under the No-Action Alternative, the level of employment associated with UP's Bayport Loop operations would be expected to remain constant.

4.11.3 Impact Analysis – Public Services

SEA analyzed the effects of the Proposed Action and Alternatives on the public services found in the project area. SEA considered the potential effects of the demands placed on emergency services, fire protection, police, medical services, and schools in the vicinity of the Proposed Action.

4.11.3.1 Build Alternatives

Construction and operation of the proposed new rail line would not place significant additional demands on the public services in the project area. The Build Alternatives would not generate a significant influx of people to the area to increase the demands on public services. The addition of approximately 13 miles of new rail line to an area that is industrial and supports many miles of existing rail lines that carry hazardous and nonhazardous materials would not generate notable additional demands on local emergency services. The Build Alternatives would have negligible effects on public services.

4.11.3.2 No-Build Alternative

Negligible effects would result from the No-Build Alternative. The existing rail lines already carry rail traffic and the addition of two trains per day would not increase demands on public services.

4.11.3.3 No-Action Alternative

The No-Action Alternative would not have any effects on public services beyond those negligible effects occurring under existing conditions. These effects include the demands on public services created by the UP workforce that serves the Bayport Loop industries.

4.11.4 Impact Analysis – Recreation

SEA considered the potential effects of the Proposed Action and Alternatives on recreation in the project area. The effects of the Proposed Action and Alternatives on publicly owned recreational resources are also considered in the Section 4(f) evaluation found in Section 4.17 of this Draft EIS. Potential impacts to recreation could occur when construction or operation of a Proposed Action result in:

- The introduction of noise or light pollution into national or state parks or monuments.
- The loss of recreational lands or suitability of lands for recreation.
- The elimination of an area or portion of an area from eligibility for designation as wilderness.
- The elimination of the wild and scenic river status or eligibility of all or a portion of any stream of river.
- The disturbance or elimination of recreational opportunities or resources.

4.11.4.1 Build Alternatives

Construction and operation of the Build Alternatives would have a negligible impact on recreational opportunities in the project area.

Minor impacts from construction of the Proposed Action would be expected at Sylvan Rodriguez Park. Slightly higher impacts would be experienced with construction of Alternative 1C, due to its closer proximity to the park. However, the recreational experience at the park is currently adversely affected by noise from Ellington Field and training flights that pass directly over the park. Operation of the Proposed Action or Alternative 1C would not cause significant adverse impacts to the recreational opportunities at Sylvan Rodriguez Park, because the volume of rail traffic would be low.

Minor impacts on Baywood Country Club would be expected from construction of the Build Alternatives. However, these impacts would be temporary and would consist of noise and visual impacts. Impacts during operation of the proposed rail line would be negligible due to the expected low volume of rail traffic.

Minor impacts on recreational opportunities on Armand and Taylor Bayous may occur during construction of the rail bridges over the bayous. These impacts would be temporary, lasting only for the duration of construction. After construction, any effects on recreation would be negligible and only would apply to visual effects. However, the bridge over Taylor Bayou would be located adjacent to a highway bridge, the existing UP rail bridge, and a heavily industrialized area and would be entirely in keeping with the visual backdrop.

4.11.4.2 No-Build Alternative

No adverse impacts on recreation would result from the No-Build Alternative. The addition of two trains per day to existing lines would not impact recreational opportunities in the areas along these rail lines.

4.11.4.3 No-Action Alternative

The No-Action Alternative would have no effects on recreational opportunities in the project area.

4.11.5 Impact Analysis – Aesthetics

SEA reviewed the potential effects of the proposed Build Segments on the landscape and visual context of the project area. Effects on visual resources are often difficult to characterize due to the subjective nature of scenic value and differing perceptions of visual quality. SEA considers adverse effects to result from the intrusion of aesthetic elements that are out of character with the current visual setting.

4.11.5.1 Build Alternatives

Construction and operation of the Build Alternatives would have a negligible impact on aesthetic resources in the project area. No designated scenic areas or overlooks occur in the project area. The addition of a new rail line is not out of character with the visual resources in the project area. Along most of each Alternative alignment, the rail line would be constructed at grade and would not intrude on the visual aesthetics of the area.

The project area already contains existing rail lines and their associated rail traffic. The aesthetic character of these areas would not be affected by the addition of two trains per day to these existing rail lines.

The Build Alternatives would involve construction of new rail lines through viewsheds that currently do not contain rail lines. The construction and operation of new rail lines through the areas surrounding Ellington Field and north of Clear Lake City would not significantly alter the visual characteristics of an area that is already developed with aeronautical, commercial, and light industrial uses.

Construction of the Proposed Action would have a minor visual impact from the area of Sylvan Rodriguez Park and from residences located on the west side of the Clear Lake City

development. This view is currently characterized by Ellington Field and its aeronautical development, with a few sparse areas of trees and a drainage channel. Construction of Alternative 1C would have slightly more of a visual impact when viewed from the area of Sylvan Rodriguez Park and from residences located on the west side of Clear Lake City because of the closer proximity of the proposed rail line under this Alternative.

Construction of the grade-separated crossings of Space Center Boulevard and Red Bluff Road would have a minor visual impact, but they would not be out of character with the surrounding area. The proposed grade crossings would reflect design standards approved by TxDOT and would be consistent with other structures in the project area.

Construction of the Build Alternatives would have a minor aesthetic impact at its proposed crossings of Armand and Taylor Bayous. The bridges would be visible from the bayous and from trails in the area. Texas Parks and Wildlife Department commented that there could be a detrimental effect on aesthetic value for visitors and recreationists utilizing the Armand Bayou Coastal Preserve. However, given the small size of the proposed bridges, their low profile, and the surrounding views of petro-chemical plants, the visual characteristics of the bridges would not significantly alter the viewshed. In addition, the proposed crossing of Armand Bayou is located adjacent to a pipeline and power line crossing and another bridge is located several hundred yards downstream.

Construction of the Build Alternatives through the Bayport Loop would be commensurate with the visual nature of an area that includes petro-chemical plants, natural gas plants, rail lines and roads.

4.11.5.2 No-Build Alternative

The No-Build Alternative would have no effect on the aesthetic resources of the project area. The existing lines already carry rail traffic and the addition of two trains per day would not alter the visual character of the viewshed.

4.11.5.3 No-Action Alternative

The No-Action Alternative would have no effect on the aesthetic resources of the project area. The No-Action Alternative involves the continued operation of trains over rail lines that already exist and that contribute to the visual resources of the area. The No-Action Alternative would represent no change from the existing situation.

4.12 ENERGY

4.12.1 Methodology

SEA evaluated the effects on energy resources from construction and operation of the Proposed Action and Alternatives, including the No-Action Alternative. This evaluation included consideration of the proximity of the proposed Alternatives to existing pipeline and transmission lines.

SEA also evaluated the potential diesel fuel consumption associated with the operation of an additional two trains per day. SEA utilized and verified information supplied by the Applicants on the number of locomotives that would be used and their expected fuel consumption. This was qualitatively compared with UP's fuel consumption under the existing conditions. SEA did not quantify or estimate UP's current fuel consumption because it would be unlikely to change significantly if the Proposed Action were to be implemented and therefore, would not provide a meaningful baseline for analysis.

SEA did not quantify or estimate the potential fuel consumption by idling vehicles at grade crossings because of the low proposed rail traffic volume and associated negligible effects on grade crossing delay, as discussed in Section 4.4. SEA qualitatively evaluated the effects on energy efficiency from grade crossing delay.

4.12.2 Impact Analysis

4.12.2.1 Build Alternatives

Energy Distribution. Short-term effects on the pipeline corridors within the Bayport Loop and the project area may result from construction activities due to temporary delays in service necessary for excavation and encasement activities. Pipelines would be crossed using a combination of land bridges, encasement, and relocations in accordance with industry and regulatory standards and as routinely utilized in the project area. All construction activities would be closely coordinated with pipeline owners to ensure safety and minimal disruption to service. The Build Alternatives would not affect any of the active oil and gas wells in the project area. A negligible effect on the pipeline transport of energy resources is expected.

Four of the high-voltage wires in the Bayport Loop are located on wooden towers that may require elevation at certain locations to improve vertical clearance for the proposed rail line. Nine low-voltage lines may also need to be elevated or buried at certain locations to avoid conflict with the proposed rail line. Any such activity would be closely coordinated with Reliant Energy and other line owners to ensure that modifications meet industry and engineering safety standards and to ensure minimal disruption to service.

Within the Bayport Loop, the new rail line is proposed to run alongside existing transmission lines and pylons. UP rail lines also run parallel to these transmission lines. The proposed rail alignment, at some points, is located between the existing rail and transmission lines. The proposed rail line within the Bayport Loop would come within 50 feet or less of the transmission line pylons, at several points. This close proximity is not a safety concern under normal operating conditions. However, in the unlikely event of a derailment, the pylons could be affected. There is a remote chance that a derailed rail car could reach the foot of a pylon and it could damage the pylon, causing disruptions in electricity transmission. However, SEA considers overall effects to the transmission lines to be negligible because the probability of a derailment is extremely low and given the proposed low operating speeds, derailments would not likely cause significant damage to pylons alongside the new rail line.

Energy Consumption. The Applicants have stated that an average of two line-haul locomotives would be used for each train trip. SEA determined that the annual diesel fuel usage for two line-haul locomotives operating from the CMC Dayton Yard to the Bayport Rail Terminal would be 26,105 gallons per year.[7] SEA's calculations of fuel usage are presented in full in Appendix H - *Air Quality.*

The Applicants also have estimated that switching operations within the Bayport Loop (which will be conducted by BNSF or its designated operator) would consume an average of 82,000 gallons of diesel per year, assuming two switching locomotives operating 12 hours per day, 365 days per year.[8]

Operation of the Build Alternatives, which are all of similar length, is likely to increase diesel fuel consumption by approximately 108,105 gallons. However, SEA considers that a commensurate reduction in the amount of diesel fuel consumed by UP operations in the Bayport Loop could occur, although it would not amount to an equal reduction. SEA considers that the potential increase in fuel consumption under the Proposed Action and Alternatives would have a negligible affect on energy resources.

Transportation of Energy Resources. The transportation of energy resources is not an anticipated component of the Proposed Action and therefore, SEA has concluded that there would be no effect on the transportation of energy resources.

Transportation of Recyclable Commodities. Operation of the Proposed Action or Alternatives would not change the transportation of recyclable commodities. Commodities would simply shift from one railroad to another. SEA has concluded that there would be no effect on recyclable commodities.

Overall Energy Efficiency. The proposed project would result only in rail-to-rail diversion of traffic. Therefore, there would be no energy changes due to truck-to-rail diversions.

Road traffic delays at grade crossings can contribute to energy resource consumption. However, the grade crossing delay effects of the Build Alternatives are negligible and SEA considers quantification of the associated fuel consumption by idling vehicles to be unnecessary. SEA has concluded that the impacts to energy efficiency from grade crossing delays would be negligible.

4.12.2.2 No-Build Alternative

Under the No-Build Alternative, SEA expects negligible effects to energy resources. There would be no appreciable effect on existing pipelines or transmission lines. There would be no change in the transport of energy resources or recyclable commodities.

[7] Fuel usage estimations were based on the BNSF locomotive fuel consumption rate of 745.8 gross ton-miles per gallon (GTM/G).

[8] Based on the USEPA estimated average yard locomotive fuel consumption.

SEA expects that there would be a similar amount of diesel fuel use associated with the No-Build Alternative as for the Build Alternatives, because the lengths of rail line involved are similar. UP would continue to operate in a manner similar to its current operations to transport its share of Bayport Loop products. UP's diesel fuel use could be slightly reduced over existing conditions, if it were to decide to operate fewer trains per day. SEA has concluded that there would be a negligible effect on energy resource consumption under the No-Build Alternative.

4.12.2.3 No-Action Alternative

Under the No-Action Alternative there would be no change in existing conditions and, therefore, no impacts on energy resources beyond those that exist today. There would be no change in the transport of energy resources or recyclable commodities. There would be no appreciable change in diesel fuel use because UP would continue to operate in a similar manner to transport Bayport Loop products.

4.13 HAZARDOUS MATERIALS/WASTE SITES

4.13.1 Methodology

SEA reviewed the results of multiple searches of environmental regulatory agency databases to identify existing hazardous materials spill sites and hazardous waste sites that could potentially be affected as a result of construction activities for the Build Alternatives. The data gathering focused on an area extending at least 500 feet from the Build Alternatives and the full length of the Alternatives considered. During the site reconnaissance, where accessible, SEA observed the environmental conditions in the vicinity of sites of interest that were identified through the database searches and located within 500 feet of the Build Alternatives.

4.13.2 Impact Analysis

4.13.2.1 Build Alternatives

SEA identified four recorded cases of hazardous materials spills that either have not been declared closed or a no-further-action determination has not been recorded by the proper regulatory agency. Three of the four releases were to water bodies and would not be affected by the Build Alternatives. Due to the nature of the one land release case, no adverse environmental impacts would result from the construction activities of the Build Alternatives.

SEA determined that the Harris (Farley Street) delisted National Priority List (NPL) site located within 500 feet of Alternative 2D does not pose an environmental risk to construction activities because all contaminated materials were removed from the site and all appropriate response action was completed. SEA determined that the excavation and relocation of construction and demolition debris from Hughes Landfill during the construction of Alternative 2D would not cause any significant impacts, assuming that the proper procedures, as discussed below, are followed if undocumented hazardous materials are disturbed. Therefore, SEA deemed that the risk of disturbing known hazardous materials or hazardous waste sites is insignificant.

SEA recognized that some past releases of hazardous materials to the environment may not have been properly documented and reported by facilities located within 500 feet of the Build Alternatives. Therefore, SEA considered the potential for construction activities associated with the Build Alternatives to disturb undocumented hazardous materials spill sites and/or hazardous waste sites. Based on the results of the site reconnaissance, SEA has determined that the potential for disturbing undocumented sites is low.

SEA also examined the potential effects if any undocumented hazardous materials spill site and/or hazardous waste site is encountered and determined that the Applicants would have adequate procedures in place to ensure that workers and the environment are protected. SEA reviewed information provided by the Applicants that describes their planned steps to identify the presence of hazardous materials spill sites and hazardous waste sites prior to conducting construction activities, as well as the procedures that the Applicants and their contractors implement as part of any construction activity. The Applicants will conduct a Phase I Environmental Site Assessment in accordance with American Society of Testing Materials (ASTM) standards before conducting construction activities. If such sites are identified and cannot be avoided, the Applicants' procedures require that they document all activities associated with hazardous materials spill sites and hazardous waste sites and notify the appropriate local and state regulatory agencies in accordance with applicable regulations. SEA considers that implementation of these measures by the Applicants would ensure adequate protection of construction workers and the environment. The measures would ensure proper handling and disposal of contaminated materials, including contaminated soil, groundwater, and storm water, if such materials are encountered during construction activities associated with the Build Alternatives.

Based on its review of the available information, SEA has concluded that no significant adverse impacts on human health or the environment are likely to result from disturbances to hazardous materials spill sites and hazardous waste sites during construction activities associated with the Build Alternatives.

4.13.2.2 No-Build Alternative

Under the No-Build Alternative, no construction activities would take place. Therefore, existing hazardous materials spills sites or hazardous waste sites would not be disturbed.

4.13.2.3 No-Action Alternative

Under the No-Action Alternative, no construction activities would take place. Therefore, existing hazardous materials spills sites or hazardous waste sites would not be disturbed.

4.14 CULTURAL RESOURCES

4.14.1 Methodology

To determine potential effects on cultural resources, SEA conducted an archaeological survey which involved visual examination of the ground surface of the project area and subsurface

investigation with small shovels (see Appendix L). Survey routes directly followed the proposed Alternatives. In concurrence with the Texas Historical Commission (THC), SEA determined that a 100 percent subsurface and surface survey was appropriate for the Proposed Action, with the exception of the segment along Port Road. SEA and THC determined that a scaled-back methodology was appropriate for this segment of the Proposed Action. The methodology involved the removal of alignment segments determined to have been significantly disturbed by previous construction activities. Under the scaled-back methodology it was determined that visual examination would be sufficient in most parts of the various Alternatives. Subsurface excavations only were carried out in locations near potable water sources and on a sampling of features such as raised mounds.

Consultation with Indian tribes was not required under Section 106 of the NHPA because the project has no adverse effects to historic properties. Nevertheless, SEA contacted seven tribes with Areas of Concern in the Houston area. Several tribes expressed no concern over the Proposed Action and Alternatives and several tribes could not be reached. These tribes were added to the distribution list to receive the Notice of Availability of the Draft EIS.

4.14.2 Impact Analysis

Based on this investigation and consultation with the THC, SEA determined that no significant cultural resources would be affected by the Proposed Action and Alternatives. No further archeological investigations are recommended before construction begins.

4.14.2.1 Build Alternatives

SEA surveyed the Build Segments of the Build Alternatives. No prehistoric sites were found and only one historic site was located. The historic property was determined to be a twentieth century homestead previously recorded as site 41HR321. This site was originally discovered in 1977 and was determined not to be eligible for the NRHP. No further investigations were recommended on 41HR321 as a result of this study. As a result of desk-based investigation and reconnaissance of the Proposed Action, SEA determined that the entire route was previously disturbed. As a result no further investigations were necessary. No adverse effects are anticipated for the Proposed Action.

Desk-based assessment determined that most of the portion of Alternative 1C that differs from the Proposed Action has been previously disturbed. This portion was removed from consideration. Right-of-entry issues made it impossible to access the remaining 20 percent within the time limits of the investigation. Further assessment of this portion of Alternative 1C, utilizing high definition aerial photographs and visual examination from outside the property boundaries, determined that it was unlikely to contain any significant cultural resources. No historic or prehistoric resources were discovered. No adverse effects are anticipated for this portion of Alternative 1C.

SEA assessed and surveyed the majority of Alternative 2B. No historic or prehistoric resources were discovered. SEA could not gain access from the City of Houston to one segment, approximately 500 meters long. However, the route that Alternative 2B would take through this

property already has been significantly disturbed by the City of Houston Southeast Water Treatment Plant, which owns the land. Assessment of this segment determined that it was unlikely to contain any significant cultural resources. No adverse effects are anticipated for Alternative 2B.

SEA assessed and surveyed Alternative 2D. No historic or prehistoric resources were discovered. No adverse effects are anticipated for Alternative 2D.

4.14.2.2 No-Build Alternative

The No-Build Alternative does not involve construction and, therefore, would not cause adverse effects to historic properties.

4.14.2.3 No-Action Alternative

The No-Action Alternative does not involve construction and therefore, would not cause any adverse effects to historic properties.

4.15 NAVIGATION

4.15.1 Methodology

SEA evaluated the potential impacts of the Proposed Action and Alternatives on navigation for the five waterways characterized in Section 3.15. SEA's evaluation included examination of the No-Action Alternative, new railroad construction associated with the Build Alternatives, and operation under the Build and No-Build Alternatives. In addition to the five waterways discussed in Section 3.15, SEA also considered the waterway crossings of existing trackage that are part of the Proposed Action and Alternatives.

4.15.2 Impact Analysis

4.15.2.1 Build and No-Build Alternatives

Construction Impacts. SEA evaluated whether the construction of the Build Alternatives would adversely affect navigation of the waterways that they cross. No adverse effects on navigation from construction would result from the No-Build Alternative because no construction would be required.

Spring Gully, Big Island Slough, and Horsepen Bayou are not currently used for commercial or recreational navigation and, therefore, would not be impacted. Armand Bayou is navigable by small non-motorized vessels (e.g., canoes) in the area of the proposed crossing. There is a low privately-owned bridge downstream of the crossing that limits recreational traffic to the area. Temporary and minor interference with recreational use is expected during construction of the proposed bridge. These impacts would be short-term, lasting only during bridge construction.

Taylor Bayou has the highest amount of water-borne traffic of the waterbodies crossed by the Build Alternatives and is used by both commercial and recreational craft. The construction of the proposed bridge is expected to adversely affect navigation of the waterway only during construction of the bridge. Impacts on navigation are expected to be negligible due to the limits currently placed on navigation by the pre-existing bridges (Port Road, railroad, and SH 146).

The construction of all bridges would follow best management practices to minimize effects to the waterways (see Section 4.7 for a discussion of water quality issues).

Operation and Maintenance Impacts. No adverse effects on navigation are expected as a result of operation and maintenance of the bridges at the proposed sites.

4.15.2.2 No-Action Alternative

The No-Action Alternative would not affect navigation because there would be no new bridge construction or other activities affecting navigation of the project area waterways.

4.16 ENVIRONMENTAL JUSTICE

SEA took steps to ensure that public outreach was conducted in a manner that minority and low income communities were informed about the proposed project and able to voice any concerns and requests regarding the environmental review process. These procedures are summarized in Chapter 1, Section 1.7.

Environmental justice guidelines for public outreach do not require that more public outreach be conducted for low income and minority populations than for other populations. Rather, these guidelines require that the public outreach process be designed with attention given to some of the particular obstacles that environmental justice communities may face. Multilingual advertisements and presentation materials, diverse means of outreach and publicity, and careful selection of public hearing times and locations are all elements of such an approach.

Public participation has played an important role in this analysis. The change in rail traffic of two trains per day typically would not trigger the level of environmental justice analysis presented here. However, because the public participation process revealed substantial community concerns about potential impacts on low income and minority communities, SEA determined that a more detailed analysis would be appropriate.

4.16.1 Methodology

SEA followed a five step methodology to evaluate environmental justice impacts. However, some of the steps were not triggered because the impacts of the Proposed Action and Alternatives were not found to be significant.

- Step 1: SEA identified the potential health and environmental effects of the Proposed Action and Alternatives;

- Step 2: SEA identified the environmental justice populations that are located in the project area;
- Step 3: SEA assessed whether any potential effects to environmental justice populations could be high and adverse;
- Step 4: SEA defined the spatial distribution of environmental justice populations relative to the Proposed Action and Alternatives; and
- Step 5: SEA determined whether any potentially high and adverse effects would be disproportionately borne by environmental justice populations.

A more detailed discussion of the five step methodology is presented in Appendix M. The distribution of minority and low income communities relative to the Proposed Action and Alternatives are described in Section 3.16, which allows interested parties to identify the location of environmental justice communities relative to potential project effects.

4.16.2 Impact Analysis

Using the methodology described in Appendix M, SEA identified no potential high and adverse impacts on minority and low income populations as a result of the Proposed Action or Alternatives. The distribution of minority and low income populations is displayed in four pairs of maps, shown in Figures 4.16-1 through 4.16-4. For each pair of maps, the first map (Map A) shows the majority of the project area and the second map (Map B) shows the northern section of the project area, between Tower 87 and the CMC Dayton Yard.

The percentages of minority and low income residents are shown in Figures 4.16-1 and 4.16-2 respectively. The densities of minority and low income households are shown in Figures 4.16-3 and 4.16-4 respectively. This information on percentages and densities of minority and low income populations is shown separately to increase the transparency of the population analysis. In addition, minority and low income data cannot be combined because minority data are available from the 2000 Census, but income data for 2000 are not available. The latest available income data consist of a forecast based on a 1997 Census sample that is not divided into the same geographic units.

These maps indicate that:

1) The proposed new rail construction for all Build Alternatives is located in an area with few minorities and few low income residents relative to the general project area;

2) Existing rail corridors included in the various Alternatives pass through some areas with low income and minority concentrations;

3) There appear to be fewer minority and low income populations along the Strang Subdivision to Tower 30, compared with the Proposed Action to Tower 30;

Figure 4.16-1a
Census Blocks with a Minority Population That Exceeds 50 Percent

Figure 4.16-1b
Census Blocks with a Minority Population That Exceeds 50 Percent

Figure 4.16-2a
Census Blocks with a Proportion of Low Income Households That Exceeds 28.7 Percent

Figure 4.16-2b
Census Blocks with a Proportion of Low Income Households That Exceeds 28.7 Percent

Figure 4.16-3a
Density of Minority Population

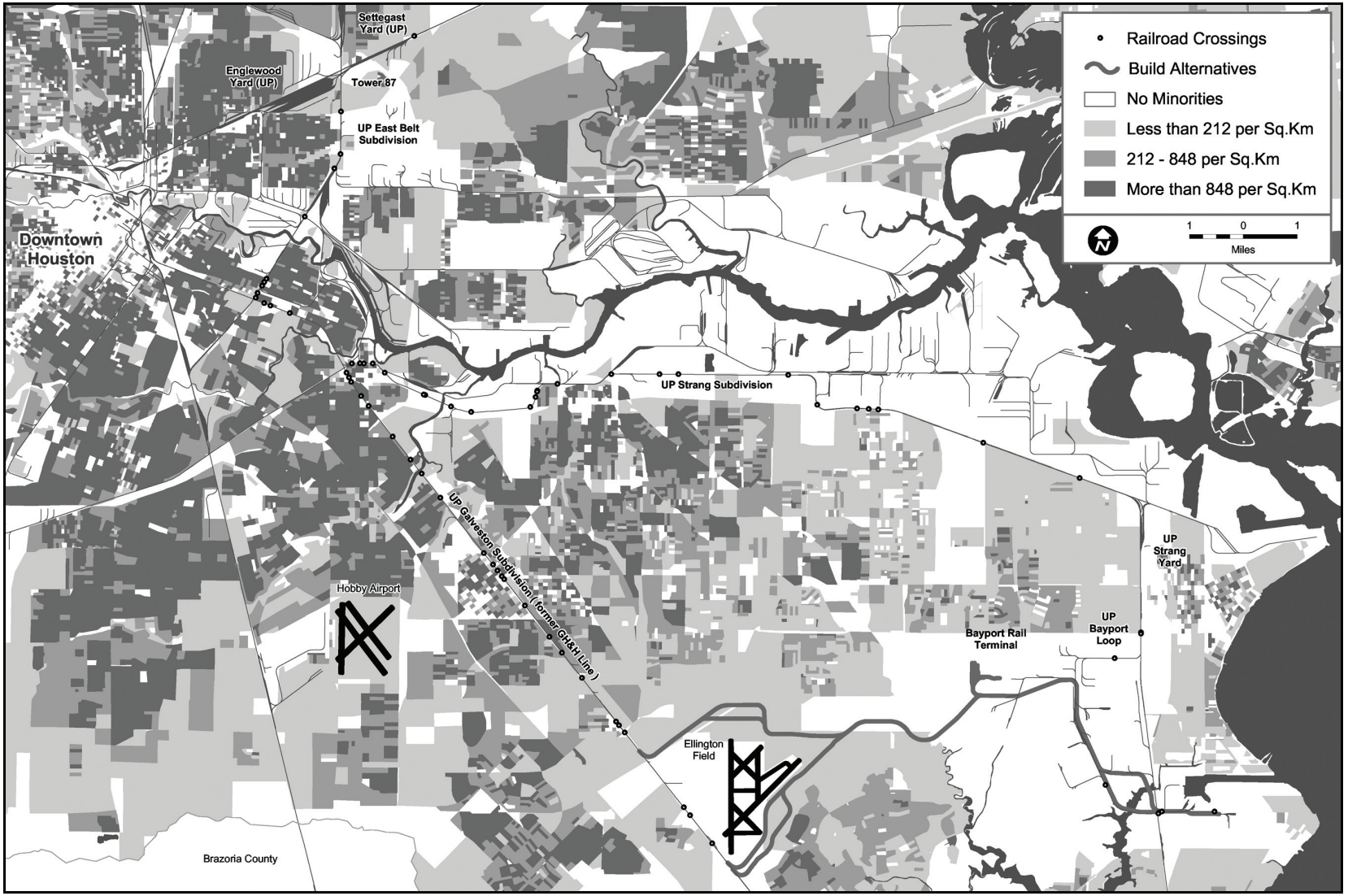


Figure 4.16-3b
Density of Minority Population

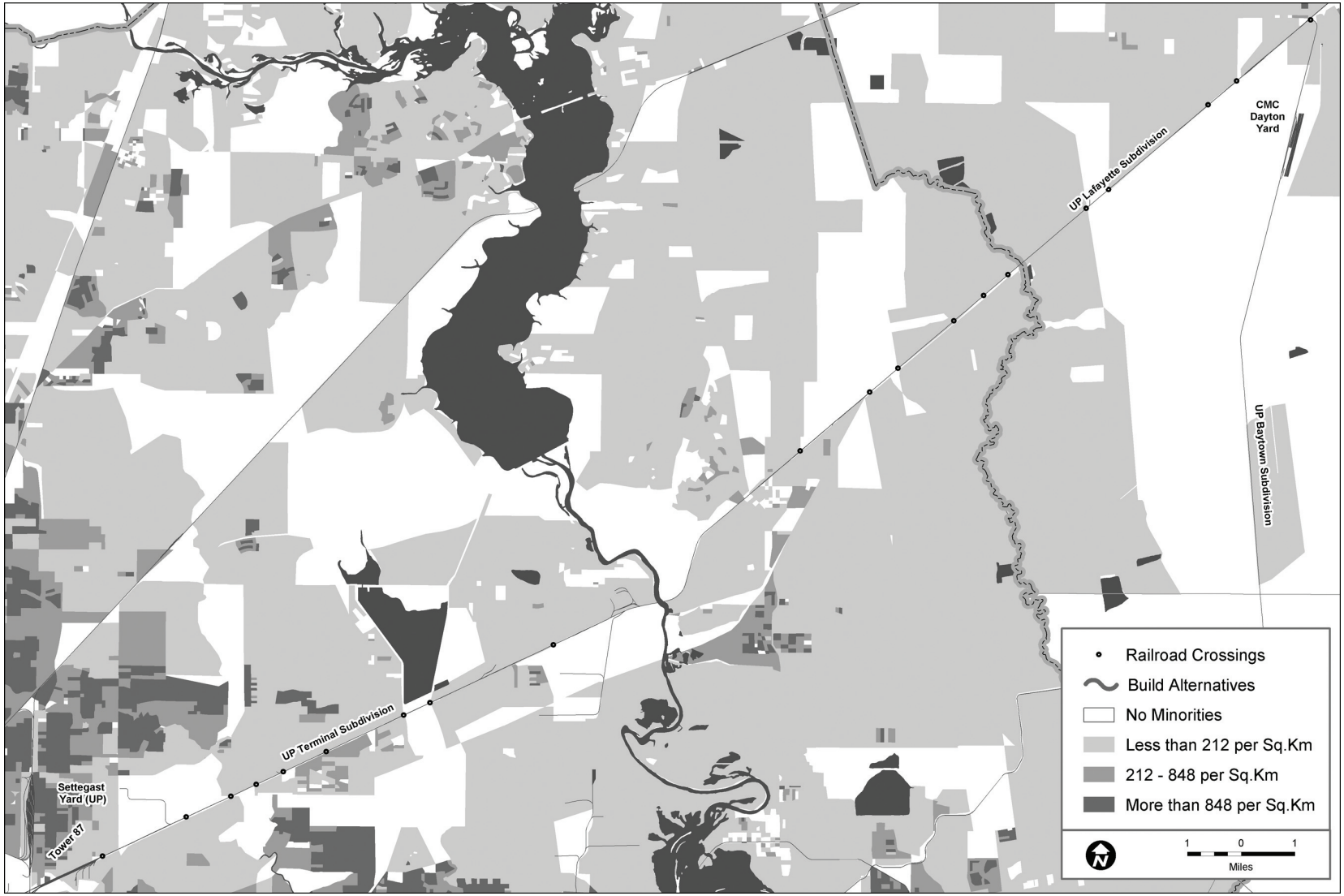


Figure 4.16-4a
Density of Low Income Population

Figure 4.16-4b
Density of Low Income Population

4) Minority and low income concentrations exist at various locations north of Tower 30 for all Alternatives.

5) There are few minority and low income populations along the Terminal, Lafayette, and Baytown Subdivisions for all of the Alternatives.

4.16.2.1 Potential Impacts to Environmental Justice Populations

SEA determined that some effects from grade crossing delay, hazardous materials transport risk, and train noise would be experienced by environmental justice populations. This is shown in Figure 4.16-1 (a and b) and Figure 4.16-2 (a and b). Figure 4.16-1 (a and b) shows minority census blocks that qualify as environmental justice populations because they exceed 50 percent minority population.[9] Figure 4.16-2 (a and b) shows low income census block groups that qualify as environmental justice populations because the proportion of households that are low income exceeds 28.7 percent.[10]

These figures indicate that environmental justice populations are located near the majority of grade crossings (shown as black dots in the figures) for all Alternatives. As indicated in Section 4.4, delay would increase at all of these crossings, but the increase would be negligible, averaging less than 0.5 seconds. These figures also show that environmental justice populations fall within the zone that might be evacuated in the event of a hazardous materials release. As indicated in Section 4.2, these evacuation distances extend up to one mile from the rail lines. Finally, these figures indicate that environmental justice populations are present in areas that would experience increased train horn noise. As indicated in Section 4.5, the increase in noise level would be at most 2 dBA and less than 0.5 dBA for the majority of the approximately 200 noise-sensitive receptors that would experience a noise level of 65 dBA L_{dn} as a result of any of the Alternatives.

4.16.2.2 Potential High and Adverse Impacts to Environmental Justice Populations

SEA determined that no high and adverse impacts would be experienced by environmental justice populations. No significant impacts were identified for grade crossing safety and delay, for hazardous materials transport, or for noise. This is described in Sections 4.4, 4.2, and 4.5, respectively.

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[9] The "50 percent or greater" minority population is the governing criterion for minority status because Harris County has a minority population of 59.7 percent. Ten percentage points above this value is 69.7% minority population. Therefore, all of the census blocks that satisfy the "50% or greater" minority criterion include all census blocks that satisfy the criterion of 10 percentage points above the county-wide average.

[10] The value of 28.7 percent is the Harris County-wide proportion of low income households, 18.7 percent, plus 10 percentage points. This is the governing criterion for low income status. All census block groups that satisfy the "greater than 50% low income households" criterion also satisfy this criterion of 10 percentage points above the county-wide average.

4.16.2.3 Spatial Distribution of Environmental Justice Populations

Figures 4.16-1 (a and b) and 4.16-2 (a and b) illustrate the spatial distribution of environmental justice populations.

Minority census blocks along Build Alternatives. Figure 4.16-1 (a and b) indicates a minimal number of minority census blocks in the vicinity of any Build Segments. No minority census blocks are adjacent to the Build Segments of either the Proposed Action or Alternative 1C, while several sparsely populated minority census blocks are located near the Build Segments of Alternatives 2B and 2D in the vicinity immediately north of Ellington Field. The GH&H line runs beside minority census blocks, although minority blocks appear to be less concentrated near the rail line. From Tower 30 to Tower 87, there are a mix of minority and nonminority blocks along the rail lines and adjacent to the grade crossings. Nearly half of the grade crossings along these routes are adjacent to minority blocks. From Tower 87 to the CMC Dayton Yard, there are minority blocks near about 15 percent of the route and near approximately one-third of the grade-crossings.

Minority census blocks along No-Action and No-Build Alternatives. Figure 4.16-1 (a and b) indicates a minimal number of minority census blocks adjacent to the Bayport Loop Industrial Lead and the Strang Subdivision, with the majority of grade crossings occurring in areas with no minority census blocks. From Tower 85 to Tower 87, there are interspersed minority census blocks, with about half of the grade crossings occurring adjacent to at least one census block.

Low income census block groups. Figure 4.16-2 (a and b) indicates that there are no low income block groups near the Build Segments of the Build Alternatives. However, all existing rail lines traverse or abut numerous low income block groups. The incidence of low income block groups along these lines increases in frequency with proximity to Downtown Houston. There are no low income blocks between Tower 87 and the CMC Dayton Yard.

4.16.2.4 Minority and Low-Income Population Densities

As discussed in Section 3.16, SEA also considered minority and low income population densities. Although this is not specifically required within Federal guidance, it is implicitly suggested in the USEPA Region VI Environmental Justice Index Methodology. Figure 4.16-3 (a and b) indicates minority population densities, while Figure 4.16-4 (a and b) indicates low income household densities. Both are divided into quartiles (described in Step 4 of the Methodology in Section 4.16.1, above). Minority densities are described as minority residents per square kilometer, while low income densities are described as low income households per square kilometer.

Minority Densities. Figure 4.16-3 (a and b) indicates sparse minority populations in the vicinity of the Build Segments of the Build Alternatives. Blocks along these segments are either in the lowest or second lowest minority density quartiles. Along the existing GH&H line south of Tower 30, minority populations are substantially more concentrated than compared with the Bayport Loop Industrial Lead and the Strang Subdivision. The existing lines from Tower 30 to Tower 87 have many adjacent blocks in the highest minority population density quartile.

Between Tower 87 and the CMC Dayton Yard there is one small segment (Beaumont Place) that falls above the two lowest minority density quartiles.

Low Income Household Density. Figure 4.16-4 (a and b) shows that the area containing the Build Segments of the Build Alternatives is characterized by the lowest quartile of low income household density. The GH&H line south of Tower 30 traverses several block groups with low income household densities in the highest quartile. In contrast, the Bayport Loop Industrial Lead and the Strang Subdivision traverse no census block groups in the third or fourth highest density quartile until the area near Tower 30. Existing lines from Tower 30 to Tower 87 traverse varying densities of low income households, but run mostly through the highest quartile density of low income households. The route from Tower 87 to the CMC Dayton Yard has one small segment (Beaumont Place) that falls above the two lowest low income density quartiles.

4.17 SECTION 4(f) EVALUATION

4.17.1 Background

Section 4(f) of the USDOT Act of 1966 (re-codified at 49 U.S.C. Section 303) provides for the protection of publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites. FAA and USCG are cooperating agencies in the preparation of this EIS, and are required to complete a Section 4(f) evaluation as part of their permitting authority.

Section 4(f) states that USDOT may only approve a transportation project that requires the use of a publicly owned park, recreation area, wildlife or waterfowl refuge, or significant historic site if:

- there is no prudent and feasible Alternative to using that land; and
- the project includes all possible planning to minimize harm to the resource.

Section 4(f) applies only to the use of publicly owned parks, recreation areas, and wildlife or waterfowl refuges, not privately owned land. However, Section 4(f) applies to all historic sites. This land is referred to as Section 4(f) property or a Section 4(f) resource.

The word "use" in this evaluation refers to land that would be directly taken or acquired for construction of the proposed rail line. It also applies to situations where the proposed project would substantially impair the intended use of the property (referred to by the courts as constructive use). Such substantial impairment would occur if effects stemming from the proximity of the proposed rail line were sufficiently serious that the value of the site in terms of its intended use and enjoyment were to be significantly reduced or lost. Where there is a constructive use of a Section 4(f) property, substantial impairment can be equated with significant impacts under NEPA.

4.17.2 Methodology

The Proposed Action and Alternatives, including the No-Action Alternative, were evaluated to determine whether any potential Section 4(f) property is located within their rights-of-way or in adjacent areas. Descriptions and maps of the Proposed Action and Alternatives are provided in

Chapter 2 of this Draft EIS. SEA analyzed the potential effects to any Section 4(f) property from the Proposed Action and Alternatives. The results of this evaluation are explained below.

4.17.3 Impact Analysis

The Proposed Action and Alternatives would not require a direct taking of Section 4(f) property. No land from publicly owned parks, recreation areas, wildlife or waterfowl refuges, or historic sites would be directly taken along any of the Alternatives, including the No-Action Alternative. However, under the Build Alternatives, two bridges would be constructed over bayous, which constitute a Section 4(f) resource. The Proposed Action and Alternative 1C would be constructed in the vicinity of Sylvan Rodriguez Park, which is a Section 4(f) resource.

4.17.3.1 Armand Bayou

Each of the Build Alternatives would cross Armand Bayou south of Baywood Country Club. The land in this area is not publicly owned and is therefore, not classified as Section 4(f) property. The streambed from bank to bank is owned by the Texas GLO and can be considered a Section 4(f) resource. Armand Bayou is not classified as a Wild and Scenic River and its primary purpose is not recreation, although it is used for some recreational boating. Armand Bayou is tidal for approximately eight miles above its confluence with Clear Lake. Stretches of Armand Bayou to the southwest of the crossing point for the proposed new rail line are scenic and relatively undisturbed. Its tidal channel has been designated as the Armand Bayou Coastal Preserve, which is one of four coastal preserves designated by the state. Under the Texas Coastal Preserve Program, the Texas GLO leases the preserves to the TPWD, which manages the water and biological resources. The Armand Bayou Coastal Preserve is open to non-motorized boats and is regularly used for recreational boat trips. Armand Bayou is designated as an Ecologically Significant River and Stream Segment in accordance with the Texas Water Development Board's rules (31 TAC 357.8).

Each of the Build Alternatives would require a bridge to be constructed over Armand Bayou. At the crossing point, Armand Bayou is approximately 30 feet wide with a riparian buffer. High tension electricity transmission wires cross Armand Bayou approximately 100 feet downstream of the proposed bridge in an easement that also contains pipelines. After crossing Armand Bayou, the transmission wires turn north into another pipeline easement located 100 feet from the proposed rail bridge. TPWD has indicated that the proposed crossing could have detrimental visual impacts and that it could interfere with environmental education opportunities in conjunction with the Armand Bayou Nature Center. However, given the existing pipeline easements, transmission wires and towers, and the presence in the area of access roads to gas wells, the proposed rail bridge would not impair the quality of the Section 4(f) resource.

4.17.3.2 Taylor Bayou

Each of the Build Alternatives also would require a crossing of Taylor Bayou. Taylor Bayou is a tidal estuarine water body located north of Clear Lake between Taylor Lake Village and Seabrook. Taylor Bayou begins near the Bayport Channel and flows approximately three miles to its mouth at Clear Lake. Tidal marshes exist along most of the banks of the bayou. The tidal

marshes are designated as EFH by the NMFS. The land surrounding the bayou, in the area of the proposed rail line bridge is privately owned and does not qualify as a Section 4(f) resource. The streambed of Taylor Bayou is publicly owned and qualifies as a Section 4(f) resource. The portion of Taylor Bayou in the proposed crossing area is currently crossed by several roads, rail lines, and pipelines. The Port Road bridge across Taylor Bayou is located approximately 50 feet downstream of the proposed crossing. An existing UP rail bridge is located another 100 feet downstream and transmission wires cross the bayou another 100 feet downstream. Construction of a rail bridge at this point on Taylor Bayou would not impair the quality of the Section 4(f) resource.

4.17.3.3 Sylvan Rodriguez Park

Construction of Alternative 1C would have negligible constructive use effects on Sylvan Rodriguez Park. Sylvan Rodriguez Park is owned by the Houston Parks and Recreation Department and is located on Clear Lake City Boulevard, near the southeastern corner of Ellington Field. The park is approximately 111 acres in size and offers a range of recreational opportunities, including sports fields, a small lake, and a jogging trail. The park is located immediately adjacent to a pipeline corridor and at its closest point is less than 100 feet from the GH&H line and State Highway 3, approximately 1,200 feet from the edge of Ellington Field, and approximately 2,800 feet from the end of runway 17R/35L. Sylvan Rodriguez Park is considered a Section 4(f) resource.

The Proposed Action would be located approximately 1,000 feet from the park and Alternative 1C would be located approximately 300 feet from the park boundary. No land from Sylvan Rodriguez Park would be directly taken for construction of the Proposed Action or Alternative 1C. There would be no noise effect and limited aesthetic effect on the park from operation of the proposed rail line. SEA concludes that the quality of the recreational experience at the park would not be significantly impacted by construction or operation of the Proposed Action or Alternative 1C.